PHILOSOPHICAL TRANSACTIONS.

GIVING SOME

ACCOUNT

OF THE

Preſent Undertakings, *Studies*, and *Labours*

OF THE

INGENIOUS,

IN MANY

Conſiderable Parts of the WORLD.

VOL. XXXVIII. For the Years 1733, 1734.

LONDON:

Printed for W. INNYS and R. MANBY, *Printers* to the *Royal Society*, at the Weſt End of St. *Paul*'s. 1735.

PHILOSOPHICAL
TRANSACTIONS
GIVEN BY

Jos: Banks

TO

ROGER GALE, Esq;

VICE-PRESIDENT and TREASURER

OF THE

ROYAL SOCIETY

OF

LONDON,

FOR

Promoting NATURAL KNOWLEDGE,

This Thirty-Eighth VOLUME *of*

Philosophical Transactions

Is humbly Dedicated by

His most obedient, and

Most humble Servant,

CROMWELL MORTIMER, *R.S.Secr.*

Numb. 427. Beginning
VOL. XXXVIII.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *January*, *February*, and *March*, 1733.

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Jos: Banks

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III. *Ex-*

II. *Explanation of an Eſſay on the Uſe of the* Bile *in the* Animal Oeconomy, *by* Alexander Stuart, *M. D. Phyſician in Ordinary to her Majeſty, F. R. S. and of the College of Phyſicians.* Vide N°. 414.

IN that ſhort Eſſay on the Uſe of the *Bile* in the *Animal Oeconomy*, N°. 414, of the *Tranſactions* of this *Society*, ſome Points, which required a farther Illuſtration, having been there, for the ſake of Brevity, only hinted at; it is neceſſary, and I hope may be of ſome Uſe, to ſet theſe Points in a clearer Light: Which I ſhall endeavour to do, by ſolving ſuch Difficulties, and anſwering ſuch Remarks, as have occurred in Converſation and Correſpondence on that Subject.

The firſt Remark which deſerves Regard is, that I take no Notice of the Effect of the *Gall* ſpilt upon the external Coat of the *Inteſtines* from the Wound in the *Gall-Bladder*, whoſe *Stimulus* on the Outſide is ſuppoſed ſufficient to have produced, and to have ſolved all the *Phænomena*, or Symptoms obſerved and related in the Caſe: So that all the Symptoms which I attribute to a Want of the *Stimulus* of the *Gall* on the Inſide of the *Inteſtines*, might have been more properly aſcribed to the ſame *Stimulus*, acting upon the Outſide of the uppermoſt *Guts*, ſituated neareſt to the *Gall-Bladder*, whoſe compleat Contraction by the Force of that *Stimulus*, expelling

expelling the Air out of their Cavity, and forcing it into the inferiour *Guts* (as in windy *Cholics*) would have diſtended them to the Pitch mentioned in that Eſſay. At the ſame time it is acknowledged, that had the Gall been carried clean out of the Body by any Vent, ſo as that no *Stimulus* had remained to act either upon the Inſide or the Outſide of the *Inteſtines*, then my Way of accounting for the Symptoms had been good, and the Concluſions juſt.

I acknowledge that there is ſome Appearance of Reaſon for this Remark, and the Objection which it implies; but the whole Strength of the Argument lies in a Suppoſition that a *Stimulus* on the Outſide of the *Inteſtines*, is capable of exciting a Contraction, ſupplying the Want of that *Stimulus* on the Inſide, and alſo of cauſing a preternatural Diſtenſion of the whole Canal. The Contrary of all which I ſhall endeavour to prove.

In order to this it is neceſſary to premiſe, what perhaps may not have been univerſally adverted to, yet can be no ſooner propoſed than acknowledged.

1. That the whole Action of the *Nerves*, whether in Senſation or in Muſcular Motion, is exerted at their Extremities only.

2. That the Sides of the *Nerves* every where along their whole Tracts, are entirely inſenſible, and ſerve neither for Senſation nor Motion.

The *Apparatus* of Nature towards both theſe Actions makes this plain. Towards Senſation we ſee, that the *medullary* Subſtance of the *Nerves* at their Extremities is diveſted of its Coverings, which are Proceſſes of the *Dura* and *Pia Mater*, and ends bare

bare in the Form of ſmall ſoft *Papillæ*, from their Figure, called by *Anatomiſts Pyramidales*, on the Surface of the *Cutis*, covered over with the *Cuticula*, where they act their Part in Senſation, or Feeling, Taſting, and Smelling. The ſoft denudated Branches of the *Optic Nerve* which compoſe the *Retina*, and what for the ſame Reaſon is called the *Portio Mollis* of the Auditory *Nerve*, the immediate Inſtruments of Seeing and Hearing, prove the ſame.

Again, it is the Extremities of the *Nerves* that enter with their Coverings into the *Muſcle*, and into each *Fibre* of the *Muſcle* to which they belong; where they depoſit their Contents, or act their Part in muſcular Motion.

But the Sides of the *Nerves* along their whole Tracts, are inſenſible or void of Feeling, becauſe their *medullary* Subſtance, and its Contents, which are the only immediate Inſtruments of Senſation in them, are here covered with the *Pia* and *Dura Mater*, the laſt of which is the ſtrongeſt, denſeſt, and moſt impenetrable Membrane of the whole Body, capable of defending and conveying the tender *medullary* Subſtance of the *Nerves* and its Contents, ſafe, unhurt, and undiſſipated to the ſeveral Organs of Senſation and Motion, at their Extremities the Seats of their Action.

A further Confirmation of this from Experience, is the Inſenſibility of the Side of a large viſible Branch of a *Nerve*, which ſometimes happens to lie bare and expoſed in a Wound or Ulcer, where it will bear the Touch of the Probe without feeling, and occaſions no more Pain than in Wounds and Ulcers

of

of the ſame kind, where the *Nerves* are not expoſed, unleſs the inveſting Membranes, the *Dura* and *Pia Mater*, be by any Accident wounded, lacerated or corroded; in which Caſe, the *medullary* Subſtance being laid bare, exquiſite Pain is felt, and very ſevere Symptoms enſue, which are hardly to be overcome, or never ſo eaſily as by cutting the *Nerve* quite through, ſo as that the Extremity may retire within the Fleſh, and the *medullary* Subſtance be protected by it.

By which it appears, that the Sides of the *Nerves* are inſenſible or void of Feeling, and that the Extremity of the *medullary* Subſtance, either by Nature, or by ſome Accident, laid bare, is the only immediate Inſtrument of Senſation.

This being premiſed, the Structure of the *Inteſtines*, the Parts in Queſtion in the Caſe before us, comes to be conſidered.

The *Inteſtines* are made up of four *Tunics*, or Coats.

The firſt, or external Coat, is a common membranous Covering, borrowed of the *Peritonæum*.

The ſecond is compoſed of their annular, contractile, muſcular *Fibres*, the immediate Inſtruments of their periſtaltic Motion.

The third is the nervous Coat, a reticular *Plexus* of *Nerves* intermixed with *Blood-Veſſels* and *Glands*, plac'd immediately under the muſcular, and over the villous Coat.

The fourth is the villous or innermoſt Coat, on the concave Side, rightly called villous, as it appears view'd through a Microſcope; tho' from its Appearance to the naked Eye, it be erroneouſly call'd the mu-

cous

cous Coat. This is generally allowed to conſiſt of the capillary Extremities, or rather Roots of the *Lacteals*, and the excretory *Ducts* of the *Glands*, which together form theſe *Villi* that are ſeen in it. Among theſe, ſuitable to Analogy in all other Parts of the Body, the *Papillæ Pyramidales*, or Extremities of the *Nerves*, are lodg'd under the *Cuticula* of the *nervous* Coat, for the Uſes of Senſation, ſo neceſſary for the Purpoſes of Nature, in this very ſenſible Part the Inſide of the *Guts*, which is known to be ſo quickly and neceſſarily affected by the Qualities of their Contents.

The proper *Nerves* of the firſt or outward Coat, are thoſe of the *Peritonæum*, of which it is a Part, ariſing from the *Medulla Spinalis* of the Loins and *Os Sacrum:* Whereas the *Nerves* proper to the *Guts*, are of the *Par Vagum*, and *menſenteric Plexus:* Therefore as there is no Communication of *Nerves* between this external Coat or Covering, and the proper Subſtance of the *Inteſtines* themſelves, a *Stimulus* acting upon this external Coat only, would not affect the *Guts* ſo as to excite any conſiderable Degree, either of Senſation or Motion in them.

Again the proper *Nerves* of the *Inteſtines*, whoſe Origin, Diſpoſition, and Situation have been already deſcribed, terminate either in the muſcular contractile *Fibres* of the Coat immediately above them, or carry their Extremities to the Inſide, where they terminate under the *Cuticula*, for the uſe of Senſation: ſo that a *Stimulus* on the outſide of the *Inteſtines*, beſides the Difficulty of paſſing through the two external Coats, before it could reach the proper *Nerves*

of the *Guts*, would at laſt only irritate their Sides, where they are inſenſible, becauſe covered with the *Dura Mater:* And if it might be ſuppoſed, that ſuch a *Stimulus* as is in Queſtion, to wit, the *Gall*, could have penetrated through theſe Coats into the Cavity, where the ſenſible Extremities of the proper *Nerves* of the *Guts* lie expoſed to it, yet ſuch a Filtration through all theſe Coats, as it could not be performed ſoon, nor in great Quantity, ſo it would enter at laſt, diveſted in a great Meaſure of its groſſer, ſaline, oleaginous, and pungent Parts, by the Filtration, and thereby loſe the Power of a *Stimulus* on the Inſide; as the Situation of the Parts, and Diſpoſition of the *Nerves* above deſcribed, made it an ineffectual one on the Outſide, as much as if it had been carried quite out of the Body.

To conclude, if the *Gall* ſpilt on the Outſide of the *Guts*, had been capable of exciting a Contraction in any Part of them, ſo ſoon as it came to cover the whole Surface, it muſt have had the ſame Effect equally every where, and the whole Canal ſhould have been found contracted to its ſmalleſt Diameter: Whereas it was found every where diſtended to a great Pitch.

It is therefore plain, that a *Stimulus* on the outſide of the *Inteſtines*, has not the Effect of ſuch a *Stimulus* on the Inſide. It can neither excite them to a Contraction; promote their periſtaltic Motion; nor ſupply the Defect or Want of ſuch a *Stimulus* on the Inſide, much leſs occaſion ſuch an univerſal Diſtention, or account for the Symptoms ariſing from it, which is what I undertook to prove.

It was for theſe Reaſons, and to avoid Prolixity, that the *Gall* ſpilt on the outſide of the *Inteſtines*, was not taken Notice of in that Eſſay.

The ſecond Difficulty is how a freſh Recruit of *Chyle* ſhould be a Cauſe of Sleep.

The Experiments which I made before this *Society*, as printed in *Tranſact.* N°. 424, I hope may ſerve to juſtify what I ſhall here aſſume, concerning the Nature and Exiſtence of the *nervous Fluid*, or animal Spirits, in the Solution of this ſecond Difficulty.

The Argument which has been offer'd, runs thus: It is well known that People after eating plentifully are often inclined to Sleep, long before the *Chyle* can be ſuppoſed to be got into the Blood; therefore a freſh Recruit of *Chyle* cannot be the Cauſe of Sleep; but there muſt be ſome other Cauſe, at leaſt at that time.

Which Cauſe is aſſigned by ſuppoſing, that after a plentiful Meal the diſtended Stomach will load and oppreſs the deſcending *Aorta*, ſo as to hinder the *Blood* in its Deſcent, and thereby force a greater Quantity than uſual into the *Aorta Aſcendens*, which by its diſtended Branches in the Brain will obſtruct the Secretion of the Animal Spirits through the *Glands* of the cortical Subſtance into the Origin of the *Nerves*, and thereby produce Sleep.

This being generally eſteemed a mechanical Account of the Cauſe of Sleep after Meals, deſerves the greater Attention.

In anſwer to which, if ſuch was the true Cauſe of Sleep after Meals, it ought to have the ſame Effect upon the *Cerebellum*, from whence moſt of the *Nerves*, that ſerve in the natural and vital Functions,

ariſe; and ſo would hinder theſe Functions, to wit Digeſtion, the periſtaltic Motion, Reſpiration, and the Circulation of the *Blood*, all which, on the contrary, are obſerved to be more regular and ſtronger in Sleep, than when we are awake; at leaſt in a healthy and temperate Perſon, who has uſed moderate Exerciſe.

Again, Gluttony, Drunkenneſs, and Flatuſes, which overload the *Stomach*, and therefore, according to this *Hypotheſis*, ought to produce the quieteſt and moſt ſerene Repoſe in Sleep, do, on the contrary, bring Inquietude, or broken and interrupted Reſt; and when to the greateſt Exceſs, a lethargic Sleep, which is a Diſeaſe for the Time, and ſometimes terminates in Death.

The *Incubus* alſo, which is juſtly ſuppoſed to ariſe from an Inflation or Diſtention of the *Stomach*, in a ſupine Poſture in Bed, oppreſſing the *Aorta Deſcendens*, ought to produce quiet Reſt; whereas nothing diſturbs more, as it firſt brings the Perſon out of quiet Sleep into a ſort of waking Dream, with a Senſe of Oppreſſion, and at laſt awakes him quite, in a kind of Terror, with Palpitation of the Heart.

And indeed as nothing contributes more to ſound and quiet Reſt than an eaſy Digeſtion and Reſpiration, a ſedate, equal and regular Circulation of the *Blood*; that is, an uninterrupted Function of all the natural and vital Parts; the Reverſe of theſe, and particularly an interrupted or difficult Circulation, if to any conſiderable Pitch, muſt produce the contrary Effects, to wit, Reſtleſſneſs or Inquietude of ſome Kind or Degree; as in Fevers and other Diſtempers attended with ſuch Irregularities of the *Animal Oeconomy*.

The

The Difficulty which is ſuggeſted about the *Chyle*'s not getting ſoon enough into the *Blood*, by the Way of the *Lacteals*, to produce this Effect in ſuch as ſleep immediately after a plentiful Meal, vaniſheth when we conſider, that this very rarely happens, at leaſt never attends temperate People, in perfect Health, and in a temperate Climate; but ſuch as are groſs Feeders, Drunkards, Corpulent, Short-neck'd, by Conſtitution or Make liable to Apoplexy or Palſy, or have formerly ſuffered by ſuch Diſtempers, or live in a hot Country.

In groſs Feeders, Drunkards, and ſuch as are Corpulent, from theſe Cauſes the *Lacteals* are never quite empty; in ſuch the Food of the preſent Meal, by exciting the periſtaltic Motion, will, in a few Minutes, preſs forward the *Chyle* of the preceeding Meal into the *Blood*. In full Veſſels or *Tubes* the Reception and Diſcharge will be inſtantaneous, or nearly ſuch; becauſe ſuppoſing the Appertures to be free or unobſtructed, as much preciſely will iſſue at one Extremity of a full Veſſel or *Tube*, as is forced into it at the oppoſite Extremity; and that inſtantaneouſly, becauſe of the Contiguity of the *Globules*, or Particles of the *Fluid* it contains.

In Short-neck'd People the Paſſage between the *Heart* and the *Brain* being proportionally ſhort, the Force or *Momentum* of the Circulation in the *Brain*, is by ſo much the greater; but a ſtrong and ſwift Circulation is an Enemy to all Secretions, as is evident in *Fevers*, and mechanically demonſtrable; for all the Secretions being bylateral Branches going off at or near to right Angles (which is very remarkable in the *Brain*) a ſwift Circulation or Motion along or parallel

to

to the Axis, carries along with it what ſhould be laterally ſecerned. Hence a Paucity of Animal Spirits in Short-neck'd People, who by this Make are liable to Apoplexies, Palſies, Coma's, Lethargies, a Liſtleſſneſs, Inactivity, and Drowſineſs, eſpecially after Meals, when the freſh *Chyle* has got Admiſſion, to abſorb a Part of the already few remaining Spirits, which muſt be recruited in Sleep.

Again in hot Climates, a continual Waſte or Diſſipation of the Spirits by Heat, makes the Inhabitants generally lazy and unactive: In ſuch the recent *Chyle*, the groſſeſt circulating *Fluid* of the whole Body, will quickly abſorb the few remaining Spirits, and diſpoſe them to ſleep after every Meal: Except when the Cool of the Evening checks Perſpiration and the Evaporation of thoſe Spirits, which were recruited by Sleep in the Day-time, and therefore remain plentiful enough to ſupport their Activity after Supper, when the Buſineſs of the Meaner, and Diverſions of the richer Sort begin; which, in colder Climates, is the Caſe after Breakfaſt and Dinner.

For a farther Confirmation of this, Brandy, and the Spirits of fermented Liquors, are known to produce a drouſy Stupidity in ſuch as drink them to any Pitch, and an habitual Dulneſs in habitual Drinkers of them; and, when drank to Exceſs, throw the Drunken into a kind of lethargic Sleep for ſome time. Yet the Quantity taken down, ſufficient to produce theſe Effects, is never ſo much as to load or diſtend the *Stomach*, ſo as to oppreſs the *Aorta Deſcendens*, or to hinder the Circulation downwards; and therefore cannot be ſuppoſed to produce Sleep or Sleepi-

Sleepineſs in that Manner, but in a different Way, which ſhall be deſcribed in the Sequel of this Diſcourſe.

Thus this Poſition concerning what has been generally eſteemed a mechanical Cauſe of Sleep after Meals, being, I think, ſufficiently refuted, it remains that I endeavour to eſtabliſh ſuch a general Cauſe of Sleep, as may be conformable to what is advanced in the Eſſay under Conſideration.

I believe it will hardly be denied, that the Cauſe of Sleep in general is a Want of a ſufficient Quantity of animal Spirits for the Uſe and Exerciſe of the animal Functions: Therefore whatever prevents their Recruit; hinders or impedes their Secretion; abſorbs or fetters them when produced; and whatever exhauſts or evaporates them, by occaſioning a Paucity of Spirits, will, in a healthy Perſon, produce a Liſtleſſneſs, Lazineſs, a Tendency to Sleep, or Sleep itſelf, in Proportion to that Paucity of the remaining Spirits.

If we enumerate all the known remote Cauſes of Sleep or Sleepineſs, we ſhall find that in ſome one or other of the Ways above ſet down, they do all of them tend to produce this immediate or proximate Cauſe, to wit, an Impairment of the nervous *Fluid*, or animal Spirits, and thereby bring on theſe ſeveral Diſpoſitions to Sleep, or Sleep itſelf.

All the remote Cauſes of Sleep, or Sleepineſs, I think may be fully comprehended in the four following Particulars, and conſidered in the following Order.

I. Exer-

I. Exerciſe.
II. A too plentiful Meal.
III. Drunkenneſs, or a too great Quantity of fermented Liquors, or of their diſtilled Spirits.
IV. The whole Tribe of *Narcotics*, or *Soporifics*, of which *Opium*, and its ſeveral Preparations, are the chief.

I. Exerciſe appears to waſte all the *Fluids*, and particularly the animal Spirits, the active Inſtruments of all Motion; ſo that the Remains are not ſufficient for the Exigencies of the natural and vital Functions; and alſo to ſupply the Demands of voluntary Motion, and to aſſiſt in Senſation, and the Operations of the Mind.

And here it is proper to ſhow how this Waſte neceſſarily brings on Sleep in a healthy Perſon, and how the natural and vital Motions, and Functions of Digeſtion, Reſpiration, and Circulation, notwithſtanding this Waſte, do neceſſarily go on in Sleep, leading the Remains of the Spirits to their Aſſiſtance, and making the Deficiency fall to the Share of the animal or voluntary Motions and Organs of Senſation.

In order to ſhew this, let us obſerve what is very obvious, that when any *Muſcle* is brought into Action againſt our Will by a ſuperior Force, as when a ſtronger Man bends or extends my Arm contrary to my Will or Inclination, the Benders or Extenſers of my Arm ſwell and contract in the ſame manner, and the Afflux of the Blood and Spirits to the contracting Muſcles,

Muſcles, is the ſame as when I do it voluntarily: Therefore by any external or adventitious Force, the Blood and Spirits will be derived upon the Part thus forced into Action.

But all the natural and vital Parts have ſuch an external or adventitious Force continually acting upon them. In the *Primæ Viæ* the Weight and other Qualities of our Food and Drink, mixed with Air and *Bile*, excite the periſtaltic Motion, as neceſſarily as the Weight of a Clock, or Spring of a Watch wound up, keeps the Wheels and Pendulum, *&c.* in Motion.

The *Chyle* forced from thence, together with the *Blood* returning into the *Heart*, as neceſſarily ſet its elaſtic Springs at work, and the ſame *Blood* and *Chyle* forced into the *Arteries* by it, make their *Diaſtole* and following *Syſtole* inavoidable.

The Air by its Elaſticity, and the whole Weight of the Atmoſphere, forceth itſelf into the elaſtic Pipes and Veſicles of the *Lungs*, and dilates them; which by their Elaſticity and Mechaniſm, aſſiſted by various *Muſcles*, and the Ribs and Cartilages of the *Thorax*, as neceſſarily repel it in Expiration.

It is therefore evident, that all theſe natural and vital Parts are acted upon, and ſet at Work by an external adventitious and irreſiſtible Force, continually exciting them whether we will or not, whether awake or aſleep; therefore the *Blood* and remaining Spirits after Labour, will be mechanically and neceſſarily led to all theſe Parts that are thus forced into Action at all times, but eſpecially moſt regularly and copiouſly in Sleep, when all external Objects

ceaſe to ſollicit our Senſes, and the Will does no longer determine the Spirits into the *Muſcles* of voluntary Motion; which two Kind of Actions, as well as the Operations and Paſſions of our Mind, do, in the Day-time, make ſtrong Derivations of the Spirits from the natural and vital Functions; which, for that reaſon, are never ſo perfect as in ſound and undiſturbed Sleep.

Thoſe who are acquainted with the Doctrine of Derivations and Revulſions, founded upon innumerable Obſervations in the *Animal Oeconomy* and Practice of Phyſick, do know, that a Flux of any of the animal *Fluids* ariſing from Nature, or from a Diſeaſe, or provoked by Art to any one or more Parts of the Body, or to any Organ of Secretion or Excretion, will cauſe a ſenſible proportional Diminution of the Afflux to, and of the Secretion and Execretion by the other Parts and Organs.

Therefore ſo ſoon as a Deficiency of animal Spirits happens by Labour, or from any other Cauſe whatever, that Defect will be firſt felt in the Organs of Senſation, the Muſcles of voluntary Motion, and the Operations of our Mind; becauſe theſe are not acted upon by ſuch powerful and irreſiſtible Agents, as the Organs of the natural and vital Functions are in perfect Health; for the Mind being ſenſible of the Defect of Spirits for its Actions and Operations, chooſeth to forbear; we retire from external Objects, and then the Whole of the remaining Spirits are led to the natural and vital Organs, by the Mechaniſm above deſcribed; and the Organs of Senſation and voluntary Motion muſt be entirely deſerted by them for that time; which is the State of Sleep, and

which

which will continue until a greater Quantity of Spirits be recruited, than is conſumed in the natural and vital Functions ; at which time the Redundancy or Overplus begins again to be ſecerned into the other deſerted *Nerves*, to wit, into thoſe of Senſation and voluntary Motion ; which, flowing now copiouſly into the relaxed *Muſcles*, excites Stretching, Yawning, *&c.* and at laſt rouſeth out of Sleep.

II. A too plentiful Meal is known to cauſe a Heavineſs, Inactivity, Liſtleſſneſs, an Averſion to Motion or Action, a Drowſineſs, Sleepineſs, and in ſome Sleep itſelf, ſoon after eating.

It has been prov'd above, that this cannot proceed from a Diſtention of the *Stomach* ; I have alſo endeavoured to prove, that in ſuch the *Lacteals* are never empty, and that the *Chyle* of the preceding Meal is forced through them into the *Blood* by the ſucceeding, almoſt inſtantaneouſly, or ſo ſoon as the periſtaltic Motion is excited or encreaſed by the Food taken down, which muſt be during the time of ſuch a Meal, or very ſoon after, according to the Degree of Fullneſs of the *Lacteals* before that Meal. What Change then can we imagine to have happened to the Body in this time of a Meal ſo remarkable, and ſo likely to affect the *Oeconomy*, as that of the Admiſſion of a *Fluid* into the *Blood*, much groſſer and leſs fluid than itſelf? Such a Mixture muſt render the whole Maſs groſſer, or of a thicker Conſiſtence than before, as it quickly mixeth with the finer, and abſorbs its moſt fluid Parts ; but it will hardly be denied, that if there is ſuch a *Fluid* as animal Spirits, they muſt be the fineſt and moſt depurated *Fluid* of the *Blood*: Theſe therefore will be abſorbed, and

mixed with this groſſer crude *Fluid* the *Chyle*, and therefore will be diminiſhed by it; and being thus intangled, will be more difficultly ſecreted, and in leſs Quantity: Hence that Paucity of Spirits, which will diſpoſe to ſleep in the manner above-deſcribed, in ſpeaking of a Paucity of Spirits after Labour or Exerciſe.

III. How far ſtrong fermented vegetable Juices or Liquors, and their diſtill'd Spirits drank to any Pitch of Exceſs, do bring on Sleep, or ſome Degrees of it, has already been ſaid.

The diſtilled Spirits of fermented Liquors, are known to leſſen all the Secretions and Excretions, and therefore are of uſe in *Diarrhæas*, in exceſſive and colliquative Sweatings; and I have known *French* Brandy, taken incautiouſly, to have put a Stop to a Sweat procur'd by *Sudorifics*. In habitual Drinkers of them, they gradually leſſen the Secretion of the *Bile*, and inſenſible Perſpiration, and thereby bring them at laſt into the Jaundice and Dropſy.

Spirituous Liquors, and particularly *French* Brandy in the moſt remarkable Manner, being mixed with the *Blood* as it flows from a Vein into a Porringer, unites the ſerous with the globular red Part of the *Blood*, to ſuch a Degree, as that no *Serum* ſeparates from it in many Hours, and in ſome not at all; an Experiment which may be eaſily made; which ſhews in what manner it hinders the Secretions in the Body, theſe being all of them of the ſerous Kind: Hence that great Impurity of the *Blood* ariſing from a Reſtraint of the Secretions in ſuch People; and alſo that Paucity of Spirits, the general Cauſe of Sleep and Dulneſs, very different from the Alacrity and Vivacity of the Temperate, and even of Water-drinkers.

That

That therefore which fetters or binds up all the *Seroſities*, or moſt fluid Parts of the *Blood*, and proves a ſtrong *Copula* between them and the red *Globules* thereof, may be reaſonably ſuppoſed to fetter or tye up the fineſt *Fluid* of all, to wit, the animal Spirits with the reſt, and in the ſame manner to hinder their Secretion, and thereby produce Sleep, or ſome ſuch Degree of it as is above-mention'd.

IV. As to *Opium*, and all the Claſs of *Soporifics*, if we compare the viſible Effects of them with what has been ſaid above of *Brandy*, or Spirits of fermented Liquors, we ſhall find them much the ſame. *Opium* is known to leſſen or ſuppreſs all the Secretions and Excretions, and is therefore of ſuch remarkable uſe in *Fluxes*, *Rheums*, *Catarrhs*, &c. it has indeed been conceived to be a *Sudorific*, but that only in Compoſition with *Aromatics*, as in *Venice* or *London Treacle*; or with *ſaline* Bodies, as the *Sapo Tartareus* in the *Pil. Matthæi* or *Starkij*; and that too aſſiſted by plentiful Dilution with warm Sack-Whey, or ſuch like Liquors, and the Addition of Volatile Spirits of *Hart's-Horn*, &c. which are known to thin the Blood, as Mr. *Leewenhoeck*'s Microſcopical Obſervations, and the mixing of theſe volatile ſaline Spirits with *Blood*, as it runs out of the Vein into a Porringer, do ſufficiently evince. Which ſhews, that theſe Volatile Salts are good Correctors of *Opium*, as they break down and colliquate the *Blood*, and therefore tend to promote the ſerous Secretions, which *Opium* by itſelf, and all diſtill'd Spirits of fermented Liquors do retain, or reſtrain for ſome time, incorporating the *Seroſities* with the red

red *Globules* of the *Blood*, as has been obſerved before.

In hot Countries, where large Doſes of *Opium* are taken, the Effects are nearly the ſame with what we obſerve in Drinkers of diſtill'd Spirits of fermented Liquors; to wit, a ſmall Doſe exhilerates, a greater brings on ſome Degree of Drunkenneſs, or temporary Madneſs; this encreas'd will lay to Sleep, and a very great Doſe will kill.

In this Compariſon therefore, may we not juſtly conclude a Parity in the Cauſes, from the Similitude of the Effects; though all the ſecondary Qualities of ſuch Cauſes, which offer themſelves outwardly to our Senſes, be apparently very different; thus Gunpowder is as much a latent Fire as Brandy, and will exert itſelf in that Shape to a far greater Degree than it, in equal Circumſtances, that is, by the leaſt Contact of Fire; therefore, I ſay, that though *Brandy* and *Opium* ſhew no outward Reſemblance to our Senſes in Smell, Taſte, Colour, Conſiſtence, and ſuch like ſecondary Qualities, no more than *Brandy* and *Gun-powder*; yet if in proper and equal Circumſtances, that is, in Contact and Mixture with the *Blood*, they produce the ſame, or nearly the ſame Effects, we may juſtly conclude, that there is a latent Similitude of primary Qualities in their Natures, which they make manifeſt in proper and equal Circumſtances, in producing the ſame or parallel Effects.

But it has been ſhewn above, how, and in what manner *Brandy* fetters and intangles the animal Spirits, and other *Fluids* of the *Blood*, uniting them too intimately with the groſſer Parts, and thereby hin-

hindering their due Secretion for ſome time; whence a Paucity of Spirits, which diſcovers itſelf by an Inequality and Irregularity of their Diſtribution in Drunkenneſs; a ſtill greater Defect in Dulneſs and Drowſineſs; yet more in Sleep, and a total Suppreſſion of their Secretion, as well to the natural and vital as to the animal Organs, which is Death, the Effect of the greateſt Doſes either of ſuch diſtill'd Spirits or of *Opium*.

From what has been ſaid on this Subject, it ſeems as plain as the Nature of ſuch a Phyſical Demonſtration will admit of.

I. That the univerſal Cauſe of Sleep is a Paucity of animal Spirits.

II. That this Defect will ariſe from whatever exhauſts, waſtes or evaporates them when produced, as Labour or Exerciſe; or from whatever abſorbs them, as a great Quantity of crude *Chyle*, recently and ſuddenly admitted into the *Blood*, in the Time of, or ſoon after, a plentiful Meal; or whatever can fetter or re-unite them with the groſſer Parts of the *Blood*, as much as Brandy or ſpiritous fermented Liquors and *Opiates*. All theſe either by evaporating and waſting them, or by hindering their Production or Secretion, do bring on that Paucity of Spirits ſpoken of, and Sleep or ſome Degree of Sleepineſs, as a neceſſary Conſequence.

Yet it will be ſtill true upon the ſame Foot of Reaſoning, that where the *Blood* is extreamly depurated, and the Secretions and Excretions from it already perfectly performed, as in long Faſting the whole Maſs of *Blood* is become only fit for the Secretion of Spirits; has no Crudity or Impurity in it, to abſorb or

fetter

fetter the Spirits already produced; and no crude *Chyle* admitted to anſwer that End; in ſuch a Caſe *Opiats* can have no Effect, the Spirits cannot be abſorb'd, fetter'd or reſtrained, where the Qualities of the Maſs of *Blood* do not concur to that Effect.

Another concurring Cauſe of the Inefficacy of *Opiats* in the Caſe of Faſting, is, that all the natural Parts, thoſe, to wit, of the *Primæ Viæ*, which ſerve for Digeſtion, are at Reſt, for want of the Weight and *Stimulus* of Food, and alſo of the *Gall* in the Caſe referred to, to keep up their periſtaltic Motion; therefore few or none of the Spirits being ſpent on thoſe Parts, there is a greater Supply ſent to the animal Organs of Senſation and voluntary Motion; and indeed in ſuch a Caſe even the vital Parts for Reſpiration and Circulation do act but very ſluggiſhly for want of a Recruit of *Blood* and *Fluids* proper to excite their Functions: Hence alſo the Supply of Spirits to the Organs of Senſation and voluntary Motion, is by ſo much the greater; and the Poſſibility of reſtraining their Secretion, for the Reaſons above aſſigned, impracticable by any Power of *Opium*, without the Acceſſion of a freſh Recruit of *Chyle*.

Hence alſo thoſe who have any conſiderable Defect in the natural and vital Functions, or in either of them, by Obſtructions of the *Viſcera*, are generally bad Sleepers, or Watchful; and in ſuch *Opiats* have but little Effect to procure Reſt; with this great Diſadvantage, that by impeding the Secretions, they increaſe the Obſtructions; though in many Caſes, where the *Viſcera* are ſound, they muſt be acknowledged to be excellent Medicines.

What

What has been ſaid, will alſo ſufficiently account for the anodine Power of *Opium*; for if it impedes the Secretion of the animal Spirits, the immediate active Inſtruments of all Senſation, it muſt certainly obtund or aboliſh for that Time the diſagreeable Senſation of Pain.

The third Difficulty is, how *Pus* ſhould be the Product of *Chyle*, and not of the *Blood* or *Serum*. As to which, I think it would not be difficult to prove that all the groſs Secretions are from the *Chyle*; theſe being only the Depurations of it in *Sanguification*, or in order to bring that crude and groſs *Fluid* the *Chyle* into pure and deficated *Blood*, from which no Secretion can afterwards be made, but of that pureſt *Fluid*, which it ſecretes into the *Nerves* for the Uſe of the whole *Oeconomy*.

If this be true, then *Pus* in a Wound, Ulcer, or Impoſtume, being a very groſs feculent Humour, is likelier to iſſue from the *Chyle* than from the purer and more defecated Part of the Maſs; but the farther Proof of this would be too tedious for this Place.

N. B. *The Reader will be pleaſed to excuſe an Omiſſion in* § VII, *of Symptoms in the Eſſay here referred to*, N° 414, p. 344, *relating to the Quantity of Urine, where the following Words ought to have been added*, [Not exceeding 3, or at moſt 4 Ounces in 24 Hours, ſo far as I was able to judge without meaſuring it.]

III. *A* Catalogue *of Eclipſes of* Jupiter's Satellites *for the Year* 1734. *By* James Hodgſon, *F. R. S. Maſter of the Royal Mathematical School at* Chriſt's Hoſpital, London.

ECLIPSES *of the firſt Satellite of* JUPITER.

Immerſions.				Immerſions.				Immerſions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
				9	15	24	25*	22	8	26	49
JANUARY.				11	9	52	57	24	2	55	41
1	17	5	54*	13	4	21	32	25	21	24	35
3	11	33	37	14	22	50	10	27	15	53	28*
5	6	1	23	16	17	18	49*	29	10	22	20
7	00	29	9	18	11	47	29	31	4	51	11
8	18	57	01*	20	6	16	13				
10	13	24	50	22	00	44	57	APRIL.			
12	7	52	43	23	19	13	42				
14	2	20	40	25	13	42	29*	1	23	20	3
15	20	48	39	27	8	11	17	3	17	48	54
17	15	16	40*	29	2	40	6	5	12	17	46*
19	9	44	41					7	6	46	37
21	4	12	48	MARCH.				9	1	15	27
22	22	40	55					10	19	44	14
24	17	9	6*	1	2	40	12	12	14	12	59*
26	11	37	18	2	21	9	4	14	8	41	45
28	6	5	34	4	15	37	56*	16	3	10	30
30	00	33	52	6	10	6	46	17	21	39	12
31	19	2	13*	8	4	35	38	19	16	7	55*
				9	23	4	32	21	10	36	35
FEBRUARY.				11	17	33	25*	23	5	5	15
				13	12	2	17	24	23	33	52
2	13	30	34	15	6	31	11	26	18	2	26
4	7	58	59	17	1	00	6	28	12	31	00*
6	2	27	26	18	19	29	00	30	6	59	33
7	20	55	55	20	13	57	54*				

ECLIPSES *of the first Satellite of* JUPITER.

Immerſions.				Emerſions.				Emerſions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
				18	22	22	29	5	17	17	1
	MAY.			20	16	50	47	7	11	46	9
2	1	28	4	22	11	19	8*	9	6	15	17
3	19	56	32	24	5	47	30	11	00	44	26
5	14	25	2*	26	00	15	55	12	19	13	37
7	8	53	50*	27	18	44	20	14	13	42	49
9	3	23	59	29	13	12	45	16	8	12	3
10	21	50	24					18	2	41	18
12	16	18	47*		JULY.			19	21	10	33
14	10	47	8*					21	15	39	50
	Emerſions.			1	7	41	11	23	10	9	7*
16	7	25	9	3	2	9	39	25	4	38	26
18	1	53	30	4	20	38	10	26	23	7	47
19	20	21	50	6	15	6	44	28	17	37	7
21	14	50	10*	8	9	35	18*	30	12	6	30
23	9	18	28	10	4	3	53				
25	3	46	46	11	22	32	31		SEPTEMBER.		
26	22	15	1	13	17	1	13				
28	16	43	16	15	11	29	57*	1	6	35	51*
30	11	11	32	17	5	58	43	3	1	5	13
				19	00	27	29	4	19	34	35
	JUNE.			20	18	56	18	6	14	3	57
				22	13	25	8	8	8	33	20*
1	5	39	48	24	7	54	00*	10	3	2	43
3	00	8	1	26	2	22	55	11	21	32	5
4	18	36	16	27	20	51	52	13	16	1	27
6	13	4	30*	29	15	20	52	15	10	30	49
8	7	32	46	31	9	49	52*	17	5	00	9
10	2	1	1					18	23	29	28
11	20	29	18		AUGUST.			20	17	58	47
13	14	57	34					22	12	28	6
15	9	25	52*	2	4	18	55	24	6	57	22*
17	3	54	10	3	22	47	57	26	1	26	37

ECLIPSES *of the first Satellite of* JUPITER.

Emerſions.			
D.	H.	M.	S.
27	19	55	50
29	14	25	00
OCTOBER.			
1	8	54	9
3	3	23	16
4	21	52	21
6	16	21	24
8	10	50	26
10	5	19	26*
11	23	48	25
13	18	17	19
15	12	46	12
17	7	15	1
19	1	43	45

Emerſions.			
D.	H.	M.	S.
20	20	12	27
22	14	41	8
24	9	9	47
26	3	38	25
27	22	7	2
29	16	35	33
31	11	4	2
NOVEMBER.			
2	5	32	28*
4	00	00	50
5	18	29	7
7	12	57	23
9	7	25	35
11	1	53	45
12	20	21	53

Emerſions.			
D.	H.	M.	S.
14	14	50	00
Jupiter and the Sun in Conjunction.			
DECEMBER.			
Jupiter and the Sun in Conjunction.			
Immerſions.			
21	16	21	3
23	10	48	45
25	15	16	25
26	23	44	10
28	18	11	55
30	12	39	40

ECLIPSES *of the ſecond Satellite of* JUPITER.

Immerſions.			
JANUARY.			
1	16	7	57
5	5	24	00
8	18	40	9*
12	7	56	27
15	21	12	56
19	10	29	32
22	23	46	17
26	13	3	14
30	2	20	19
FEBRUARY.			
2	15	37	35
6	4	55	00

Immerſions.			
9	18	12	32*
13	7	30	13
16	20	48	2
20	10	5	59
23	23	24	00
27	12	42	6
MARCH.			
3	2	00	22
6	15	8	39*
10	4	36	59
13	17	55	16
17	7	13	42
20	20	32	6

Immerſions.			
24	9	50	27
27	23	8	49
31	12	27	8*
APRIL.			
4	1	45	25
7	15	3	41
11	4	21	50
14	17	39	56
18	6	57	56
21	20	15	52
25	9	33	40
28	22	51	23

Eclipses of the second Satellite of Jupiter.

Immersions.				Emersions.				Emersions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
				9	3	14	16				
	MAY.			12	16	32	9		OCTOBER.		
				16	5	50	15				
2	12	9	00*	19	19	8	23	2	10	48	43
6	1	26	31	23	8	26	43*	6	00	7	33
9	14	43	59*	26	21	45	10	9	13	26	16
13	4	1	20	30	11	3	47	13	2	44	53
	Emersions.				AUGUST.			16	16	3	18
16	19	54	45					20	5	21	27*
20	9	12	3*	3	00	22	29	23	18	39	27
23	22	29	18	6	13	41	19	27	7	57	25
27	11	46	27*	10	3	00	17	30	21	15	8
31	1	3	36	13	16	19	19				
				17	5	38	27		NOVEMBER.		
	JUNE.			20	18	57	37				
				24	8	16	55*	3	10	32	36
3	14	20	41*	27	21	36	15	6	23	49	51
7	3	37	45	31	10	55	38	10	13	6	55
10	16	54	54					14	2	23	49
14	6	12	4		SEPTEMBER.			Jupiter and the Sun in Conjunction.			
17	19	29	16								
21	8	46	31	4	00	15	1		DECEMBER.		
24	22	3	51	7	13	34	21				
28	11	21	17*	11	2	53	46	Jupiter and the Sun in Conjunction.			
				14	16	13	4				
	JULY.			18	5	32	23	19	12	23	54
				21	18	51	36	23	1	39	49
2	00	38	49	25	8	10	46	26	14	55	48
5	13	56	29	28	21	29	45	30	4	11	52

Eclipses of the third Satellite of Jupiter.

D.	H.	M.	S.
January.			
Immerſions.			
6	23	59	59
14	3	55	42
21	7	52	2
28	11	49	2
Emerſions.			
7	2	17	13
14	6	13	22
21	10	10	10
28	14	7	40
February.			
Immerſions.			
4	15	46	40*
11	19	44	52
18	23	43	35
26	3	42	45
Emerſions.			
4	18	5	50*
11	22	4	36
19	2	3	55
26	6	3	43
March.			
Immerſions.			
5	7	42	21
12	11	42	3*
19	15	41	54
26	19	41	39
Emerſions.			
5	19	3	57
12	14	4	19*
19	18	4	50
26	22	5	17
April.			
Immerſions.			
2	23	41	18
10	3	40	51
17	7	40	1
24	11	38	52*
Emerſions.			
3	2	5	38
10	6	5	53
May.			
Immerſions.			
1	15	37	21
8	19	35	30
Emerſions.			
16	2	1	55
23	6	00	13
30	9	58	12*
June.			
Immerſions.			
27	23	17	8
Emerſions.			
6	13	56	4
13	17	54	3
20	21	52	12
28	1	50	38
July.			
Immerſions.			
5	3	15	15
12	7	13	52
19	11	13	4*
26	15	12	45
Emerſions.			
5	5	49	33
12	9	48	58*
19	13	49	00
26	17	49	31
August.			
Immerſions.			
2	19	12	59
9	23	13	42
17	3	14	49
24	7	16	12*
31	11	17	52

Eclipses *of the third Satellite of* Jupiter.

D.	H.	M.	S.
	August.		
	Emerſions.		
2	21	50	35
10	10	52	8
17	5	54	5
24	9	56	18
31	13	58	48
	September.		
	Immerſions.		
7	15	19	38
14	19	21	23
21	23	22	58
29	3	24	9
	Emerſions.		
7	18	1	26
14	22	4	3
22	2	6	30
29	6	8	33*
	October.		
	Immerſions.		
6	7	24	53
13	11	25	7
	Emerſions.		
6	10	10	9
13	14	11	15
20	18	11	32
27	22	11	18
	November.		
	Emerſions.		
4	2	10	13
11	6	8	17
	December.		
	Immerſions.		
16	22	56	49
24	2	51	56
31	6	47	19

Eclipses *of the fourth Satellite of* Jupiter.

November the 2d.

	H.	M.	S.
Immerſion at	3	40	39
Emerſion at	4	12	27

Jupiter and the Sun in Conjunction.

December the 22d.

	H.	M.	S.
Immerſion at	8	44	59
Emerſion at	10	27	1

N B. *Thoſe that are marked with a Star, are viſible at* London.

IV. *De*

IV. *De Sciuro volante, ſive Muro Pontico, aut Scythico* Geſneri, *& Veſpertilione admirabili* Bontij *Diſſertatio, per D^n.* Hans Sloane, *Bar^t. Pr. R. S. à* Jacobo Theodoro Klein, *Reip.* Gedanenſ. *à Secret. R. S. S. communicata. Vide* Fig. 1, 2, 3.

MULTAS fabulas circa animalia alata & volatilia irrepſiſſe in Hiſtoriam naturalem, nemo inficias ibit, qui præjudiciis, autoritate atque ingenioſis veterum figmentis, nec non quandoque narrationibus & Teſtimoniis credulæ plebis non obcœcatus, rem ipſam penitiùs inſpexit.

Optandum foret, ut hujuſmodi & plures aliæ fabulæ, ad ſeverius examen revocatæ nullum aliquando locum in Hiſtoriâ naturali invenirent, quo ipſo illis, qui minùs cautè talia evolvunt, anſa præcideretur, neſcio, quot, & quales Dracones, Baſiliſcos, Gryphos, & ſexcenta alia hujus generis portenta effingendi, unde non ſolum inductæ plebi, ſed & illis, qui ſupra vulgus ſapiunt, pro ipſâ quandoque Cathedrâ Eccleſiaſticâ, bonâ licet fide, egregiè tamen imponi ſolet.

Ejuſmodi Veterum relationes ad tædium uſque fabuloſas confutare quidem aggreſſi ſunt Clariſſimus *Scheuchzerus in Jobi Phyſicâ ſacrâ, p. 257. ſeq.* nec non, *Hyacinthus Gimma*, Diſſertatione ſecundâ Phyſico-Hiſtorico-Experimentali, *de fabuloſis Animalibus*

Fig. 4.

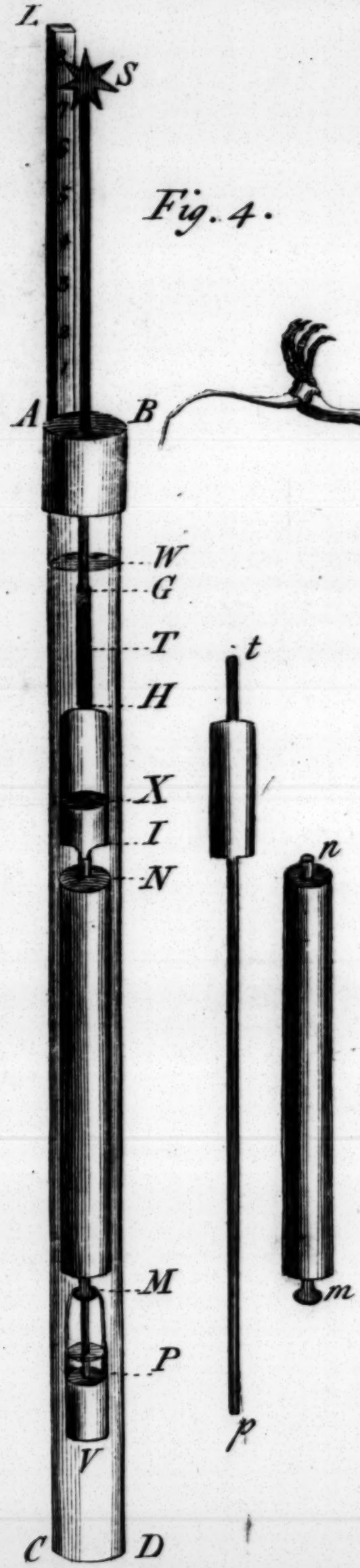


Fig. 3.



Fig. 2.



A Scale of 8 Inches

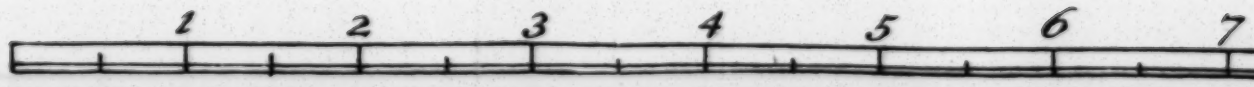


Fig. 2.

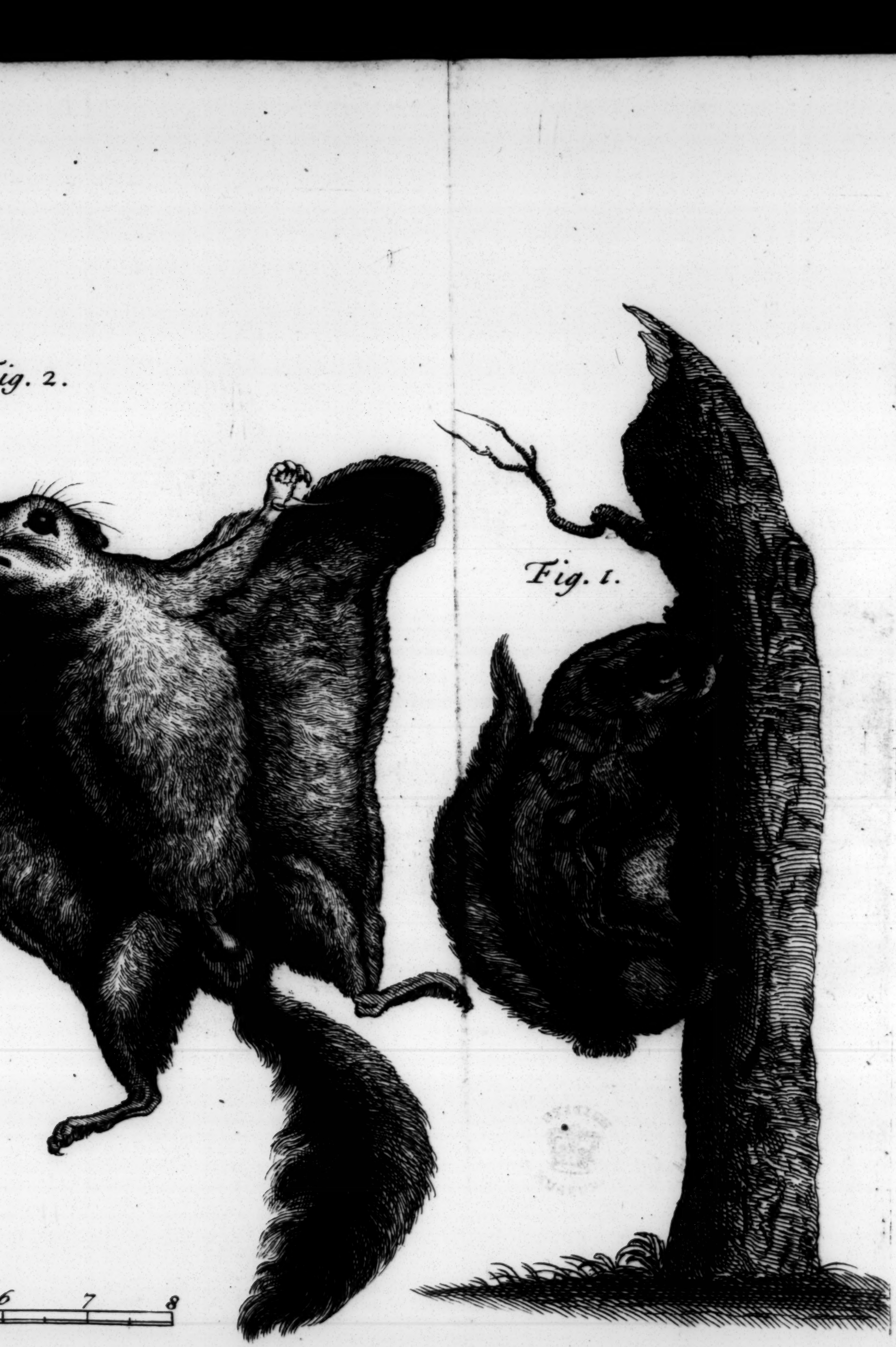


Fig. 1.

I. Mynde sc.

Fig. 4.

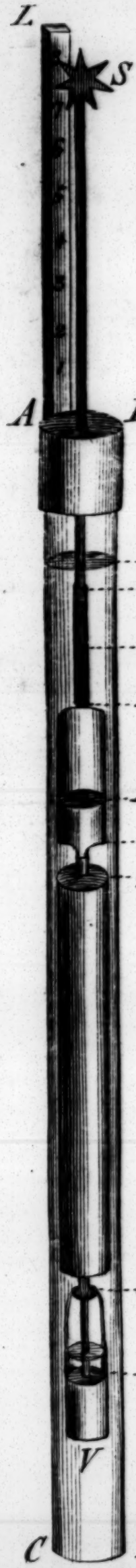
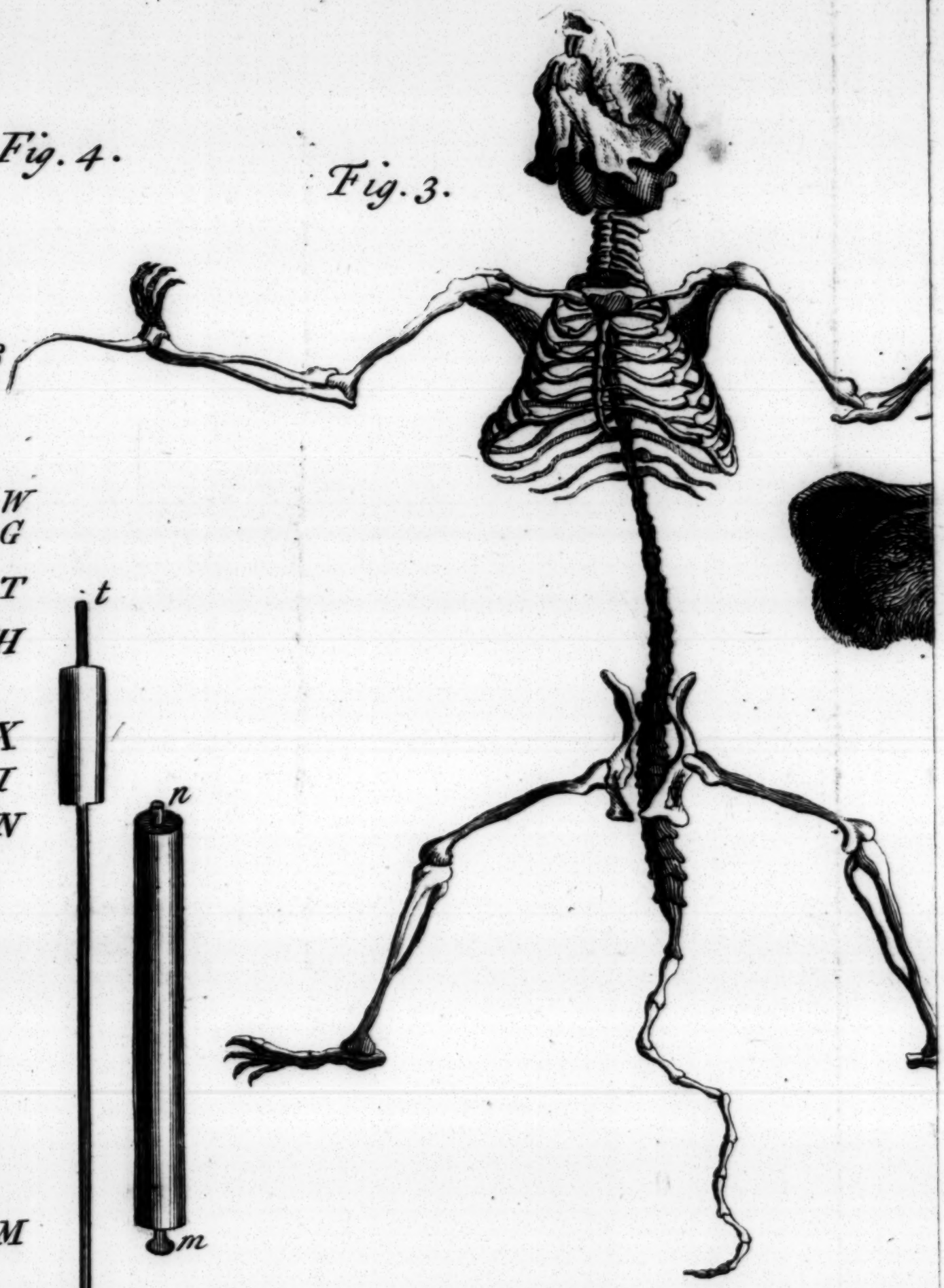
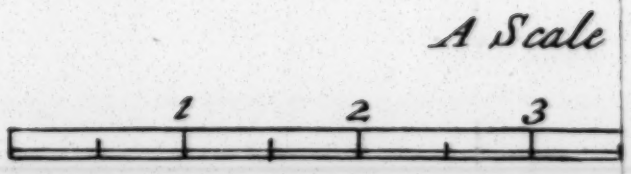


Fig. 3.





malibus, pacem verò ex victoriâ vix reportaturi, quamdiu præjudicia debellare non valebunt; tantum enim præjudicata opinio poteſt, ut etiam ſine ratione valeat autoritas.

Quod autem in ſpecie ad Quadrupeda volantia attinet, eorundem utique nonnulla dari, experientia docet. Ipſi Veſpertiliones, nobis, et Incolis utriuſque Indiæ obvij, qui, ſi non ingredientes, perreptantes tamen Quadrupedes dici poſſunt, [*Vid. Geſnerus, de avibus, p.* 695.] cauſam eorum agere videntur. Præter hos, peculiare volaticum genus Lacertorum locum ſibi vindicat, ſub nomine Lacerti volantis ſive Dracunculi alati, in Java admodum familiaris. Hunc quidem Belonius in ſingularibus obſervationibus ſuis bipedem in effigie repræſentat, cui verò Piſo in Bontio, & alij, rectè contradixerunt; Et ſanè ipſi Dracunculi, in variis Muſeis aſſervati, pleniſſimè fidem faciunt, ſe eſſe Quadrupedes, prout & in meâ Animalium Exoticorum collectione, bini Dracunculi alati, & quidem Mas & Fœmina, (uterque Quadrupes) occurrunt.

Hæc Quadrupeda propriè dicuntur volatilia, quod re ipſâ volent, id eſt, huc illuc in aëre liberè vagentur.

Impropriè autem volitare dicuntur ejuſmodi Quadrupeda quæ arbores plerumque incolunt, uti ſunt, Sciuri vulgares, & alij hujus generis mures, Martes Alpinæ, & Scythicæ, &c, imò, plura alia, quæ in ſylvis, per diſtantia invicem arborum cacumina ſalientes, quaſi volare videntur.

Inter hæc verò jure ſuo eminent, *Sciuri ſic dicti volantes*, quod quaſi velo quodam, vel peculiari inſtrumento volatorio, præ aliis inſtructi ſint.

Alterum horum invenio in *Catalogo & Deſcriptione Animalium Levini Vincentij*, 1726, *p.* 8. *Centur. primâ, Num.* 92. Sub nomine: *Sciurus Virginienſis volans*, ſine ulteriori deſcriptione; Interim Amicus quidam mihi retulit, Dominum **** Londinenſem, Sciurum Virginienſem habuiſſe, qui per integram Hyemem dormitans, nonniſi admoto calefactorio quodam evigilaret, ubi pedem unum alterumque moverat, uſque dum plenè expergefactus, vitam rurſus agere videretur.

Alterum in Grewij Muſeo regalis Societatis, p. 20, ſub nomine, *Flying Squirrel*; quem Autor pro animali habet, quod ſub nomine Felis volantis deſignat Scaliger Exerc. 217. §. 9.

Alterum exhibit Lawſonius in hiſtoria Provinciæ Carolinæ Indiæ Occidentalis; Alterum denique *Geſnerus de Quadrup. p.* 743. MUREM PONTICUM AUT SCYTHICUM SIVE SCIURUM VOLANTEM ET LATUM, appellat. Animal ipſe non vidit, ſed tantum Cutem ejus expanſam, quam etiam delineandam curavit. Dabo aliquam hujus ultimi Hiſtoriam. Superiori anno 1727, 19 Martij, Sereniſſimo Poloniarum Regi Auguſto II, duo ejuſmodi Sciuri volantes vivi à Capitaneo Minſcenſi, Joanne Ignatio Zawiſza, Varſaviæ fuerant oblati; hos obſervavit, & alterum eorundem mortuum, examini ſubjecit Magnificus à Heucher, Conſiliarius Aulicus, & Archiater Regius, ejuſdemque figuram cor-

corporis expanſi, nec non Sceleton delineatum Fig. 2, 3, pro humanitate ſuâ, mecum communicavit.

Eodem anno, Celſiſſima Princeps Radzivilia, ſupremi olim Cancellarij, Magni Ducatûs Lithuaniæ Illuſtriſſima Conjux, Hortum & Muſeum meum præſentiâ ſuâ illuſtrans, ejuſmodi animalculum vivum mihi promiſerat, quod etiam præteritâ æſtate, anni præſentis, 1728, curante Clariſſimo Floercke, M. D. & Archiatro Principis, obtinui, vitam adhuc agens.

Quod ad Patriam ejus attinet, ortum ſuum habet ex ſylvis Capitaneatûs Kriczovienſis, Diſtrictus Mohilovienſis, in confiniis Ruſſiæ.

Ajunt autem Mohilovienſes, hæc animalia cavas inhabitare quercus, & Muſco Betularum congeſto, eidem ſe involventia, per integram diem dormire, noctu verò lætari, eſcamque ſibi quærere; Hinc fieri, ut

Sequentem in modum capiantur: Ubi Venatores judicant, Sciurum latitare, in quâdam arbore cavâ, retia ad foramina ex arbore exeuntia applicant, & circa radicem arboris, ad truncum cavum ignem excitant; quamprimum ergo fumus in arborem ſurgit, & cavitates permeat, illicò Sciuri derelinquunt nidum, retibuſque irretiti, in terram decidunt, & Venatoribus in prædam cedunt.

Naturalem magnitudinem illius, quem habeo *Fig.* 1. exprimit. Minor itaque eſt Sciuro vulgari, major mure Avellano, noſtras ſylvas frequentantibus (Noſtratibus Sciuri volantes Reges familiæ ſuæ, Koenige der Grauwercke, audiunt).

Pellis molliſſima, pilis canis & ex nigro cinereis eleganter picta.

Ingentes & extantes habet oculos, nigros, aſpectu pulcherrimos, aures parvas, dentes acutiſſimos, quibus exquiſitè mordet; Plerique enim maligni ſunt: Noſter ſatis mitis eſt; non appetit morſu digitum, ori ipſius admotum, irritato tamen fidem vix habeat curioſus. Caudam, extra ſaltum conſtitutus, gratò aſpectu, tergo apprimit, Petauriſtam verò agens, demittit, hinc inde agitans. Veſcitur pane non conditô ſale, & ſummitates Betulæ recentes in deliciis habet, nuces non curat, neque Amygdalas. Lectum ex muſco Betularum egregiè diſponit, eundemque pedibus, mirâ facilitate attrahens, in ipſo quaſi ſepultus jacet; interdiu eodem non niſi ſollicitatus, aut ſiti preſſus, exit.

Quod ad ejus inſtrumentum volatorium attinet: Cutis à lateribus inſtar veli, ad palmam ferè expandi poteſt, quod ipſum velum poſteriorum pedum genubus adhæret, cum anterioribus verò articulationi oſſeæ connectitur: Ad extremitatem modò dictæ articulationis cutis quaſi plumoſa.

Ubi quietus conſidet, aut greſſus naturales facit, articulatio hæc, cum pedibus parallela diſtingui nequit; quamprimùm verò ſaltum facit, movetur illa, & cum anteriori pede angulum quaſi rectum format, unde cutis, prout ântea dictum, expanditur, quamvis etiam validus paniculus carnoſus, integram cutem permeans, ſaltum fortiter ſecundet.

Hinc

Hinc colligo, Animalculum hoc propriè non volare, ſed loca, quæ ſibi propoſuit, magis diſſita, faciliùs, ac reliqua animalia ſui generis ſaltu attingere, ſaltuſque majores perficere poſſe, quod velis ſuis mediantibus, diutiùs in aëre morari valeat.

Cum hoc Sciuro noſtro volante conferatur *Veſpertilio admirabilis* Bontij, *in Hiſt. Nat. & Med. Ind. Orient. cap.* XVI. *apud Piſon. p.* 68.

Ipſe Piſo dubitare voluit, an Veſpertilionum familiæ adſcribendus eſſet, " Quod felis ſit magni-
" tudine, ventre & pectore craſſo, & carnoſo,
" item, à cervice capitis, ad unguium uſque ex-
" tremitatem, membrana continuata, inſtar veli ex-
" panſi penè cooperiatur ; adde, quod velum hoc
" ſubtus quidem membranaceum, ut in aliis, lanu-
" gine venulis & fibris obductum appareat, ſed
" extus perpetuis molliſſimis pilis, cuniculorum
" more, canis & ex nigrocinereis, mirum in mo-
" dum veſtiatur ; tum quoque plicis illis, quibus
" alæ, more aliorum, contrahuntur, & relaxantur,
" deſtitutus, *longitudinis* autem ſit trium ferè pedum,
" ejuſdemque latitudinis."

Quod verò, ut Bontius aſſerit, hujuſmodi *Veſpertiliones admirabiles gregatim, anſerum ſylveſtrium inſtar, volitent*, illud ipſum, mole hujus animalis, ejuſque ſtructurâ, rectè perpenſâ, mihi perſuadere non poſſum, quin potiùs exiſtimem, ad Sciuros noſtros volantes talia animalia propriùs accedere, eademque velis ſuis, prout noſtros, eundemque in finem, uti. Nec obſtat fides Bontij in eo, *quod circa*

circa veſperam in aëre, vel arboribus penduli conſpiciantur; quin potiùs inde evinci poterit, illos veſpertiliones æque ac Sciuros noſtros volantes interdiu dormire, circa veſperam verò, latebras ſuas derelinquere, atque arbores per ſaltus frequentare, itaque tanquam Petauriſtas velut pendulos in aëre conſpici, ſaltu autem abſoluto, in arboribus pendulos inveniri.

De cætero, nam hi Veſpertiliones admirabiles, pari jure, quo Geſnerus *Sciuros* noſtros *volantes* dixit, appellari queant, *Feles volantes*, de eo non adeò ſollicitus ſum.

Coronidis loco notandum, rei veritate niti, quod Geſnerus ex Vincentio Beluacenſi & Olao Magno refert; Sciuros, vulgares quando aquam tranſire cupiunt, lignum leviſſimum aquæ imponere, eique inſidentes, & cauda (*non tamen, ut vult, erecta, ſed continuo mota*) velificantes (*neque flante vento, ſed tranquillo æquore*) tranſvehi; quod fide dignus fiduſque meus Emiſſarius ad Inſulas Gothlandiæ plus ſimplici vice obſervavit, & cum ſpoliis in littoribus ibidem collectis redux mirabundus mihi retulit.

V. *A Deſcription of a* Barometer, *wherein the Scale of* Variation *may be encreaſed at Pleaſure. By the Reverend Mr.* John Rowning, *Fellow of* Magdalen-*College in* Cambridge ; *Communicated by Dr.* Smith *F. R. S.*

ABCD, in *Fig.* 4, is a Cylindrical Veſſel filled with a Fluid to the Height W, in which is immerged the Barometer S V, conſiſting of the following Parts; the Principal of which is the Glaſs Tube T P (repreſented ſeparately at *t p*) whoſe upper End T is hermetically ſealed: This End does not appear to the Eye, being received by the lower End of a Tin Pipe G H, which in its other End G receives a Cylindrical Rod, or Tube S T, either hollow or ſolid, made of any Materials whatſoever, thereby fixing it to the Tube T P. The Rod S T may be taken off, in order to put in its ſtead a larger or leſſer, as Occaſion requires. S is a Star at the Top of the Rod S T, which ſerves as an Index, pointing to the graduated Scale L A, which is fixed to the Cover of the Veſſel A B C D. M N is a large Cylindrical Tube made of Tin (repreſented ſeparately at *m n*) which receives in its Cavity the ſmaller Part of the Tube T P, and is well cemented to it at both Ends, that none of the Fluid can get in.

The

The Tube T P, with this *Apparatus*, being filled with *Mercury*, and plunged into the Baſon V, which hangs by two or more Wires upon the lower End of the Tube M N, muſt be ſo poized as to float in the Liquor contained in the Veſſel A B C D, and then it will riſe when the Atmoſphere becomes lighter, and *è contrà*.

Let the ſpecifick Gravity of Quickſilver be to that of Water, or to the Liquor the Barometer floats in, as *s* to 1: and if it be propoſed that the Variations of this Compound Barometer ſhall be to the contemporary Variations of the common Barometer in the given Ratio of *n* to 1, this Effect will be obtain'd by making the Diameter of the Rod S T to the Diameter of the Cavitity of the Tube H I, as $\sqrt{\frac{n+s}{n\,s}}$ to 1, which may be thus demonſtrated.

Let us ſuppoſe that the Variation of the Height of the Quickſilver in the common Barometer, called *v*, is ſuch, that a Cubic Inch of Quickſilver ſhall riſe into the Vacuum X T; in order to which a Cubic Inch of Quickſilver muſt riſe from the Veſſel V, that is, the Surface P muſt ſubſide ſo far, that a Cubic Inch of Water (if that be the Fluid made uſe of) ſhall enter the Veſſel V, by which Means the Barometer with the Parts annexed will be heavier by a Cubic Inch of the Fluid.

Now this additional Weight of a Cubic Inch of Fluid will make the whole Barometer ſubſide (according to the Laws of Hydroſtaticks) 'till a Cubick Inch of the Rod H S, immediately extant above the Surface at W, ſhall come under it; but the Length

of

of ſuch a Magnitude of H S will exceed the Length of an equal Magnitude of Quickſilver in the larger Tube X, as much as the Square of the Diameter at X exceeds the Square of the Diameter at H (the Lengths of equal Cylinders being reciprocal to their Baſes). That is, the perpendicular Deſcent of the compound Barometer will be to v, the perpendicular Aſcent of the Mercury in the common Barometer, as d to 1 (ſuppoſing this the Ratio of the Baſes) and conſequently will be equal to $d\,v$.

But by this Deſcent, the Diſtance P W between the Surface of the ſtagnant Quickſilver and the Top of the Fluid will be augmented by a Column, whoſe Height is $d\,v$, the Deſcent of the Compound Barometer; and conſequently the Weight of the whole Column of the Fluid preſſing on the lower Surface of the Quickſilver (to which the Height X is partly owing) will be encreaſed by a Column of that Length, and this Increaſe, would produce a ſecond Aſcent of the Mercury at X equal to itſelf, namely $d\,v$, were the Fluid as heavy as Quickſilver; but ſince it is ſuppoſed to be lighter in the Ratio of s to 1, the Aſcent of the Mercury on this Account will only be $\frac{d\,v}{s}$.

But now, as in the former Caſe, when the Aſcent of the Mercury was v, the Deſcent of the Compound Barometer was ſhown to be $d\,v$, ſo here the Aſcent of the Mercury being $\frac{d\,v}{s}$, the Deſcent of the Compound Barometer will be $\frac{d\,d\,v}{s}$ and the next Deſcent $\frac{d\,d\,d\,v}{s\,s}$ and the next $\frac{d^4\,v}{s^3}$ and ſo on to Infinity

Therefore the whole Deſcent of the Compound Barometer, is to the Aſcent of the Mercury in the common Barometer, that is, n is to 1, as $d + \frac{dd}{s} + \frac{ddd}{ss} + \frac{d^4}{s^3}$ +, &c. to 1, or as $\frac{ds}{s-d}$ to 1; becauſe the Terms of the Series being in Geometrical Progreſſion, the Sum of them all is $\frac{ds}{s-d}$. Hence we have $n = \frac{ds}{s-d}$ and $ns = ds + dn$; that is, $1 : d :: n + s : ns :: \frac{n+s}{ns} : 1$ and $1 : \sqrt{d}$, that is, the Diameter of S T to the Diameter of H I, as $\sqrt{\frac{n+s}{ns}}$ to 1. Q. E. D.

Example I. Putting $s = 14$ and $n = 1$, the Variations in each Barometer will be equal, by taking the Diameter of S T to the Diameter of H I as $\sqrt{\frac{15}{14}} : 1$, that is, as 30 to 29 nearly.

Example II. If n be put infinite, the Diameter of S T will be to the Diameter of H I as $\sqrt{\frac{1}{s}}$ to 1, or 1 to $\sqrt{14}$; that is, as 1 to $3\frac{3}{4}$ nearly.

The Bottom of the Veſſel V, and the Ends of the Tubes, ought to be made rather round than flat for their more eaſy Motion up and down in the Fluid.

It will be convenient to have a ſmall Baſon fix'd upon the Star, to contain Shot for the more eaſy poiſing the Barometer in the Fluid.

VI. *An*

VI. *An Account of a Book, intituled* Chriſtiani Ludov. Gerſten Tentamina Syſtematis novi ad mutationes *Barometri* ex natura elateris aërei demonſtrandas, cui adjecta ſub finem, Diſſertatio Roris decidui errorem antiquum & vulgarem per obſervationes & experimenta nova excutiens. Francofurti MDCCXXXIII, *in* 8vo.

I Shall not here give any Account of the various Hypotheſes, which have been invented by the Learned, to ſolve the ſeveral *Phænomena* of the Barometer, and to explain the Changes of the Weather conſequent upon the Riſe and Fall of the Mercury, but refer my ſelf to the ingenious Author of this Eſſay, who alſo propoſes a new one, drawn from the Nature of the Elaſticity of the Air, and delivered after the manner of the Geometricians.

The Eſſay itſelf conſiſts of three Chapters; the firſt is wholly Mathematical, containing a new Theory concerning the Propagation of tremulous Vibrations along a Series of contiguous elaſtic Bodies. The ſecond applies this Theory to the Solution of the chief Appearances of the Baroſcope, and the laſt explains the ſeveral States or Conſtitutions of the Air and Weather connected with them.

To give a clearer and fuller Apprehenſion of this Matter, our Author thinks it neceſſary to alter the common Definition of Elaſticity, and uſe the following new Terms: The natural Equilibrium of an Elaſtic Body; its violent Equilibrium; and the Line of a tremulous Vibration.

By the *natural Equilibrium* of an Elaſtic Body, Mr. *Gerſten* means the external Figure and Extenſion, which an Elaſtic Body naturally has, when free from all external Preſſure. By a *violent Equilibrium*, he underſtands that State or Degree of Expanſion, which an Elaſtic Body is kept in by ſome external compreſſing Force; and he calls that the *Line of a tremulous Vibration*, which a Point taken at Pleaſure in an Elaſtic Body deſcribes during the Vibration.

I paſs over, for Brevity ſake, the Corollaries drawn from his Definition of Elaſticity concerning the Acceleration and Retardation of a Vibration, as alſo the Deſcription and Uſe of an Inſtrument contrived to prove the Truth of what he had advanced; nor ſhall I take any particular Notice of *Prop.* III, IV, V, and VI, wherein he treats of the Velocity of the Elaſtic Bodies in their tremulous Vibration, of the Motion of ſtretched Strings, and their iſochronal Vibrations.

In *Prop.* X he demonſtrates, that ſuppoſing three Elaſtic Bodies to be detained in a *violent Equilibrium* in the ſame Line of tremulous Vibration, if the middle be farther compreſſed on all Sides, ſo as ſtill to remain contiguous to the neighbouring Bodies, it may be reſtored, by tremulous Vibrations, to a greater Extenſion than it had before. He then

ſhews

ſhews the ſame to be true, ſuppoſing the elaſtic Body be placed between ſeveral other homogeneous elaſtic Bodies, in the State of a *violent Equilibrium*. For the Uſe and Application of all this, he refers us to the third Chapter.

The XI and XII *Propoſitions* deſerve particular Regard: In the former he deſcribes a *Machine*, by which any curious Perſon may enquire into the Phænomena and Laws of the Propagation of a tremulous Motion: In the latter he explains and demonſtrates the Theory of theſe Propagations, found out by the Help of this Machine. The Subſtance of them is this.



Suppoſe a Series of elaſtic Globules or Rings, *a*, *b*, *c*, *&c.* in the Line of a *tremulous Vibration* A B, to be kept in a *violent Equilibrium*, an Obſtacle being placed at A and B. Let us ſuppoſe alſo, the laſt Ring *a* to be compreſſed farther towards A, *&c.* ſo as that the Space left in the Line of Vibration may be taken up by the others.

Theſe Things being ſuppoſed, the Author aſſerts, that by the Reſtitution of the compreſſed Ring *a*, the Force impreſſed will be propagated through the other Rings by an individual Action, *i. e.* the Ring *a* in reſtoring itſelf will firſt act only upon *b*, and compreſs it by the Difference of the Forces. Then *b* being compreſſed, will transfer the Force it receives, not backwards, but into the Ring

Ring *c*, by an individual Action, and compreſs it likewiſe in Proportion to the Difference of the Forces, and ſo on in the other Rings. So that the Compreſſion of the laſt Ring or Body is to be look'd upon as it were like a Subſtance or Body put into Motion, which continues in Motion, 'till it meets with ſomething elſe, that makes an equal or ſufficient Reſiſtance.

From the Whole Mr. *Gerſten* draws this material Propoſition, that the Body *a* may after this manner acquire, by repeated Vibrations, a greater Expanſion in the Line A B, than it had before, provided the Series be long enough, ſo that the Force impreſſed may not be ſoon reflected. This Matter is treated of more at large in the following Propoſitions, to the end of the Chapter.

The *ſecond Chapter* is an *Application* of the *Theory* deliver'd, to the Solution of the Phænomena of the Barometer, after the following manner. The Particles of Air, ſays Mr. *Gerſten*, however unknown in other reſpects, are very well known to be capable of receiving and propagating tremulous Vibrations: From hence it follows, as alſo from ſome Principles of Sir *Iſaac Newton*, that the Air (*as in Prop.* V) may be dilated by repeated tremulous Vibrations; and by *Prop.* VI, theſe Vibrations may be generated or produced by a confuſed Motion of the Particles of the Air, or by the Agitation of a Wind.

The Author in *Prop.* VII and VIII, undertakes to demonſtrate, that the Dilatation produced by the Motion of a Wind, is leſs when the ambient Air has a Motion the ſame Way, than if the Wind moved with

with the ſame ſenſible Velocity againſt the quieſcent Atmoſphere; but that this Dilatation would be greater, if the Atmoſphere had a Flux or Current in a Direction contrary to that of the Wind.

Mr. *Gerſten* demonſtrates in the next *Propoſition*, that a perpetual *Eaſterly Wind* will reign in all Places within the Tropics, ariſing from the diurnal Heat; and that this Wind will diffuſe itſelf to the other Regions without the Tropics, and have a Direction declining from the Eaſt towards the North or South, according to the Situation of the Region on the terreſtrial Globe; that its Motion will be more remiſs, the nearer the Places are to either Pole, and that the Angle of Declination from the Eaſt will be greater for the ſame Reaſon.

The preliminary Propoſitions being thus ſettled, he proceeds in *Prop.* XIX, to account for the riſing and falling of the Mercury in the Barometer thus. The Air of the Atmoſphere in our Regions has a natural Motion or Current, whoſe Direction is ſituated between the Eaſt and North Points of the Compaſs. If therefore a ſpecial Wind ſhould ſpring up and blow in a contrary Direction, it will produce tremulous Vibrations, and conſequently Dilatations of the Air; then equal Bulks of the dilated Air dilated, will have a leſs Quantity of Matter than before: Therefore the Gravity of the Air will be leſſen'd, and by Conſequence the Quickſilver in the Weather-Glaſs will fall. And this Decreaſe of Gravity in the Air, and of the Height of the Mercury in the Baroſcope, will be proportional to the Greatneſs of the Force of the Wind and Degree of Oppoſition of its Direction to that of the Flux of the Atmoſphere conunctly.

This

This, ſays Mr. *Gerſten*, is the Reaſon why the Mercury falls when Southerly or Weſterly Winds blow, and why the Quickſilver ſinks ſo very low when theſe Winds blow Storm. On the contrary, ſince the Effect ceaſes when the Cauſe is removed, the Height of the Mercury will be greater, the fewer ſpecial Winds there are blowing in a contrary Direction. So that the gentle Winds that blow from the Points of the Compaſs which lie between the North and the Eaſt are, as the Author believes, nothing but the natural and univerſal Motion, Current or Flux of the Atmoſphere impeded by or meeting with very few ſpecial Fluxes. In order to illuſtrate and confirm the Truth of the Demonſtration of this Experiment, he hath in *Schol.* 1. quoted the Experiment of Mr. *Hauksbee*, in his *Phyſico-Mechanical Experim. Sect.* V. *Experim.* 5, *pag.* 114. *Edit.* 2.

The Deſign of *Prop.* XX is to prove, that a ſpecial Wind blowing parallel to the Direction of the univerſal, will permit the Mercury to ſtand at a greater Height, than if it had blown in a contrary Direction with the ſame Force. This he confirms by three Obſervations of his own in the *Scholium* annexed.

Propoſition XXI ſhows why the Deſcents of the Quickſilver are ſucceſſive, and do uſually, as well as regularly, precede the Arrival of the Winds that cauſe them.

Propoſition XXII aſſigns the Reaſon why very conſiderable Alterations in the Riſe or Fall of the Mercury are obſerved at the ſame time in different Places, though they are at a great Diſtance from each other.

In

In *Propoſition* XXIII, he takes into Conſideration what Influence the Heat has on the Variations of the *Baroſcope*, and denies that it cauſes any ſenſible Changes: However, in the *ſecond Scholium* of this Propoſition, he explains by it, why the Limits of the Variations of the Mercury leſſen, as the Places are nearer the *Tropics*.

The *third or laſt Chapter* is taken up in accounting for the various Changes of the Weather connected with, or conſequent upon the Riſe and Fall of the Mercury in the Weather-Glaſs. The ingenious Author beginning with the Original and Manner of forming Vapours, undertakes to ſettle and confirm, upon ſolid Principles, that which the learned and ſagacious Dr. *Halley* had long ago communicated to the learned World, upon this Argument.

In *Propoſition* VI, he makes uſe of the Principle mentioned before, concerning an elaſtic Body, that it reſtores itſelf to a greater Degree of Expanſion than it was in before its tremulous Vibrations; and endeavours, from thence, to explain more particularly the Way, that Nature takes in forming and deſtending the Cavities of the vapoury Bubbles, and afterwards emiting or detaching them from the Surface of a Fluid.

Propoſition VIII gives an Account of what will happen to Vapours, according to this Theory, when the ſurrounding Air is condenſed, or rather compreſſed by an external Cauſe. Mr. *Gerſten* affirms, that in this Caſe it is not poſſible for them to deſcend. In the *Scholium* ſubjoined, he enlarges upon this Subject, and maintains, that the ſame will happen if the

Air be condenſed by any internal Cauſe, for Inſtance, Cold.

It was this *Propoſition*, as the Author informs us, that put him upon enquiring more exactly into the Nature of Dews, which by their Fall in a cold or condenſed Air ſeemed to contradict this Part of his Theory. The Reſult of his repeated and laboured Enquiries is a *Diſſertation*, wherein he undertakes to prove by a Variety of Experiments, that Dews do not fall, as both the Vulgar and Learned believed before, but riſe out of the Earth. Of this we ſhall give a brief Account, as ſoon as we have obſerved, that in *Propoſitions* IX and X, he conſiders what will happen to Vapours in any external Dilatation of the Air; and in *Propoſition* XI, ſhows, that in that Caſe the Clouds are reſolved into Rain; and upon this he deduces, from the two laſt Propoſitions, the Reaſon of the Deſcent of the Mercury in the Barometer in rainy Weather, and, on the contrary, of its Aſcent in fine Weather.

The Deſign of the Diſſertation annexed, is to enquire into the Nature of Dew, explain its Original and Kinds.

All Dews, according to our Author's Philoſophy, owe their Original either to Vegetables or terreſtrial aſcending Exhalations. Such as derive their Origin from Vegetables, he takes to be only Exudations of their Leaves, *&c.* congealed by the Air. Before he enters upon the Proof of theſe Poſitions, he gives us three general Obſervations regarding the Circumſtances that are requiſite, in order to have a plentiful

Dew

Dew in any Place. As firſt, the Place in the Day-time muſt be expoſed to the Rays of the Sun for a conſiderable time; for in ſhady Places, or where the Sun ſhines but little, little or no Dew is to be found. There muſt alſo be a conſiderable Difference between the Heat of the Day, and the Cool of the Night; and in the laſt Place a ſufficient Moiſture in the Earth.

In treating of that Kind of Dew which is a Secretion or Exudation of a Juice in Vegetables, he obſerves, that ſome Plants furniſh the Spectator with a very entertaining Sight, the little Drops of Dew being diſpoſed after a very regular, not fortuitous Manner, upon the Surfaces or Edges of their Leaves. He gives us the Figures of ſome of them in a Plate.

To determine whether this beautiful Diſpoſition of the dewy Particles is owing to a Deſcent from the chill'd Air over the Plant, or a Secretion made from the Juices of the Plant itſelf, he covered ſeveral with Glaſſes, or earthen Veſſels, having their Mouths downwards; and yet the next Day plenty of this kind of Dew appeared in its uſual regular Form.

As to the next Species, or common Dew, he produces ſo many, and ſo differently made Experiments, againſt the vulgar Opinion of its Deſcent that if they be all true, it ſeems difficult to ſupport it againſt them. I ſhall mention ſome of the principal.

For two Months together, *viz.* *June* and *July* in 1728, every Night, ſeveral ſmooth Plates of Braſs

were laid upon the bare Ground; and during these Experiments, he never observed the least Impressions or Traces of Dew on the upper Surfaces, whreas the lower were always covered with it. He repeated the same Experiments last Year, and with the same Success, excepting in one Case, where a Plate lying too near some *Lavender*, was bedewed a little on that Part of its upper Surface, which was next the Plant, the other Part however remaining dry. He also suspended these Plates by Threads, in an horizontal Situation, and found the Dew spread almost equally over both Surfaces, at the Height of three, four, or five Feet; at the Distance of one Foot and a half, the Lower was more bedewed; but at the Heights of one, two or three Inches, the lower was overspread with Dew, while the upper had none.

He is so impartial as to mention in *Section* XVI, some Experiments which he made, and at first View seem'd to contradict his Theory: For Instance, when he used convex Bodies, whether round or cylindrical, he found the upper Surface covered with Dew, and that, whether they were laid upon the Ground, or suspended at any Height from it.

This Observation is general, and extends to Bodies of this Kind, that are only contiguous, as Heaps of Straw, Hay or Wool. It is to Observations of this Kind, the vulgar Opinion of Dews falling, owes its Birth and main Support. Mr. *Gerſten* therefore proposes to consider these distinctly in another Essay. But least any Argument should in the mean time be drawn from them against this Hypothesis of the Ascent of Dews from the Earth, he opposes Experiment to Experiment.

Thus

Thus in *Section* XVII, he lays upon the Ground a Board two Foot and a half long, eleven Inches broad, and two Inches and a half thick, with a Quarter of a Sheet of Writing-Paper upon it, having about an Inch hanging over one Edge of it.

To ſecure the Paper from being removed out of its Place by the Wind, he faſtens it with an Awl ſtuck perpendicularly, having a round wooden Handle, and lays a Knife with a cylindric wooden Handle, as an additional Weight. Upon his Return to ſee what Effect the Dew had upon them, he found that the ſmall Part of the Paper which was extended over the Edge, was moiſtened with Dew, while the reſt of the Paper, as alſo the upper Surface of the Board, were dry, but the upper Parts of the Handles of the Awl and Knife all wet.

An Experiment ſomething a-kin to this was made with a Glaſs Tube laid horizontally upon a Braſs Plate fourteen Inches ſquare, having about two Inches and a half reaching beyond the Side of the Plate. The Tube was kept from rolling by two Parallelopipeds of Lead. The Event was, the whole Surface of the Tube was bedewed, while the upper Surface of the Plate remained dry.

In *Section* XXI, XXII, we have a Set of Experiments made with concave Veſſels, having their Mouths upwards, and placed at different Elevations above the Earth. In theſe Caſes alſo he found no Dew at the Bottom of their Cavities, nor on the Sides, except within about an Inch near the Brim.

Since Hoar-Froſt is only common Dew congealed, he applied himſelf to make ſome of the ſame Kind of Experiments upon that, with Braſs Plates laid upon

the

the Ground as before. Theſe likewiſe he found covered with this kind of Froſt below, but free on the upper Superficies, agreeably to his Hypotheſis.

The Author cloſes the Diſſertation with a curious Inquiry into the Nature and Original of *Honey-Dew*. This he takes to be nothing but the Excrements of ſome Inſects which are to be met with, adhering to the lower Superficies of the Leaves of Plants; and appeals to the Evidence of Senſe for a Demonſtration.

Let any inquiſitive Perſon, ſays he, lay a Piece of Paper under any of the Leaves abounding with theſe *Animalcula*, and in a ſmall Space of Time, he will find a Liquor, or ſoft Subſtance, the very ſame with what we call *Ros Mellis*, gathered together in good Plenty upon it.

FINIS.

Jos: Banks

Numb. 428.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April*, *May* and *June*, 1733.

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II. *An Account of ſome Experiments upon the* Phoſphorus Urinæ, *which may ſerve as an Explanation to thoſe ſhewn to the* Royal Society *by Dr.* Frobenius, *on* Nov. 18, 1731, *together with ſeveral Obſervations tending to explain the Nature of that wonderful Chemical Production, by Mr.* Ambroſe GODFREY Hanckewitz, *Chemiſt, F. R. S.*

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V. HI-

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I. *An*

Fig. 1.

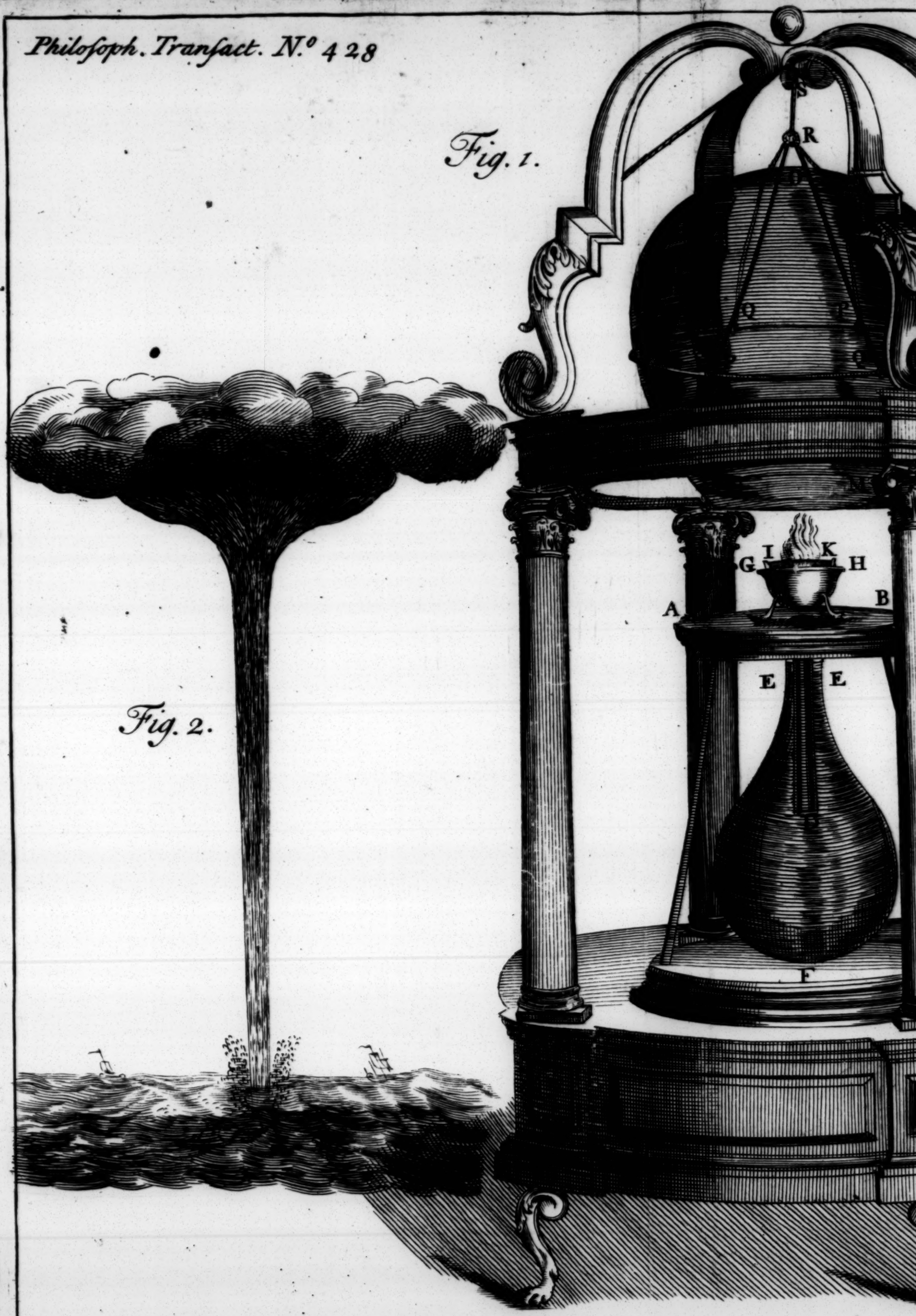


Fig. 2.

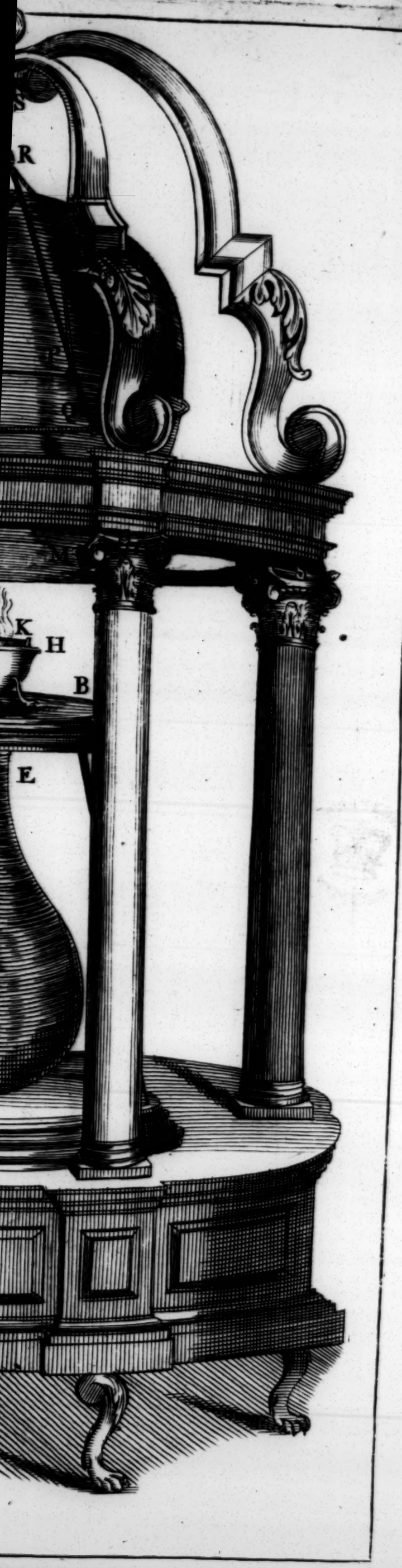

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Fig. 1.

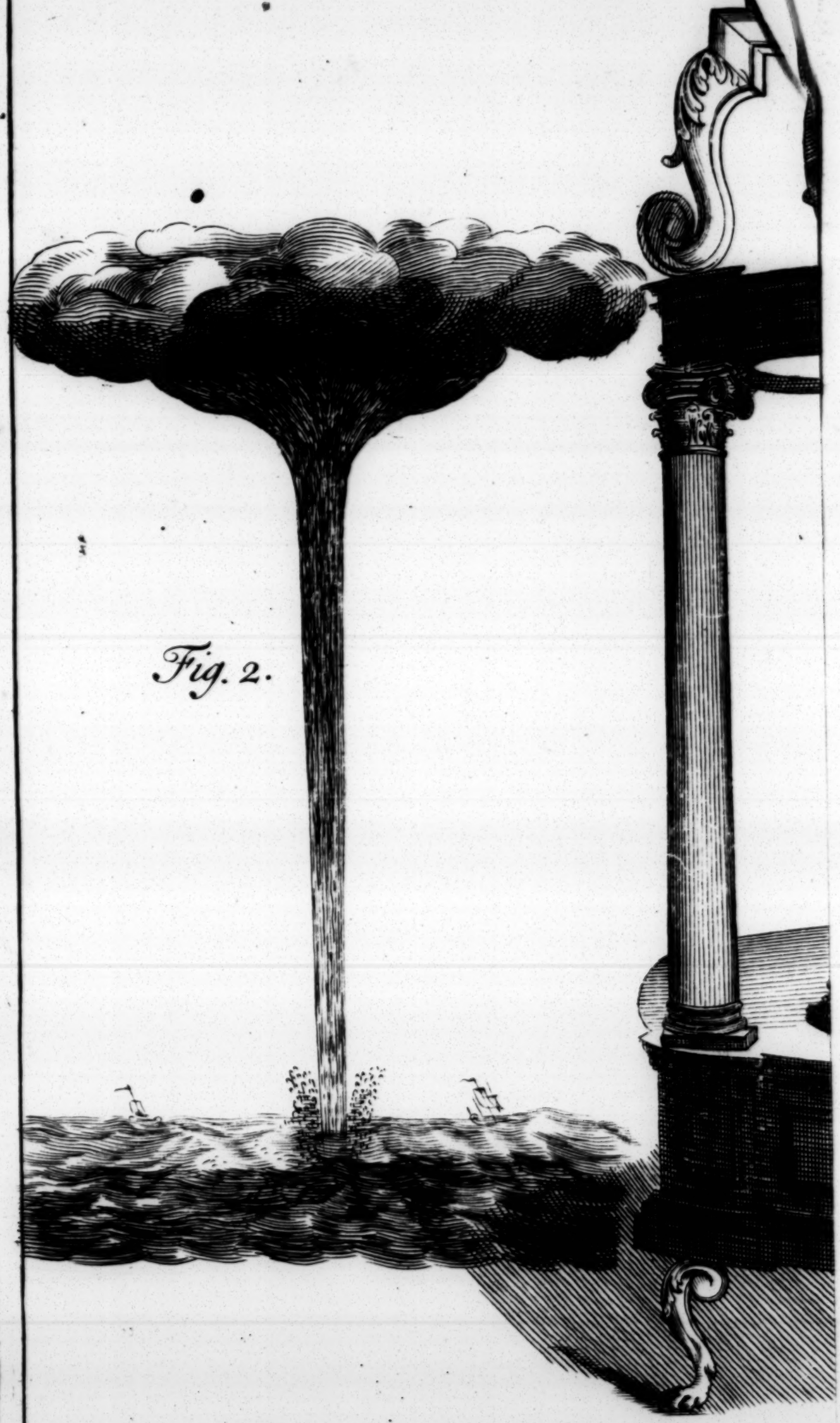


Fig. 2.

I. *An Account of the Experiments ſhewn by* Sigiſmund Auguſt Frobenius, *M. D. F. R. S. at a Meeting of the* Royal Society *on* November 18, 1731, *with his* Spiritus Vini Æthereus, *and the* Phoſphorus Urinæ, *from the Minutes of that Day, by* Cromwell Mortimer, *M. D. R. S. Secr.*

HE took a Solution of *Phoſphorus* in the Æthereal Spirit of Wine, *which he called Liquor Luminoſus*, and pour'd it into a Tub of warm Water; whereupon it gave a blue Flame and Smoak, attended with ſo ſmall a Degree of Heat, as not to burn the Hand, if put into it.

He pour'd ſome of his Æthereal Spirit of Wine upon a Tub of cold Water, and ſet it on Fire with the Point of his Sword [which being firſt heated a little, he touched with it a Piece of *Phoſphorus* lodg'd before-hand on the Side of the Tub]. After the Deflagration the Water was cold.

He then ſhewed a very extraordinary Proceſs with *Phoſphorus glacialis Urinæ*, or *Stick Phoſphorus*, of Mr. *Ambroſe* Godfrey *Hanckewitz*.

He had a very pompous Machine, which he calls *Machina Frobeniana, pro reſolutione Combuſtibilium. (inventa anno* 1730.) It is really an Improvement of the common Bell, under which the *Oleum Sulphuris per campanam*, is commonly prepared. This Machine conſiſted of a concave Plate

of Glaſs in TAB. *Fig.* 1. AB, with an Hole in the Middle C, which communicated by a Glaſs Pipe C D, with a Glaſs Receiver E E F, which ſtood underneath the Plate A B. Upon the Plate A B ſtood a maſſy Golden *Tripus*, ſuſtaining a Baſon, about four Inches Diameter G H, having within it another ſmaller one I K, of the ſame Metal, about two Inches and a half Diameter; this was heated a little: He then took ſmall Pieces of *Phoſphorus* out of a Baſon of Water, which he ſoak'd up with brown Paper, ſo that the *Phoſphorus* might be quite dry, which he put into a Spoon, and flung it into the ſmaller Golden Baſon I K; where it immediately took Fire: Then he lower'd down a large Glaſs Bell L M O, of about eighteen Inches Diameter, and containing three quarters of a Sphere; the Rim L M being exactly ground to fit cloſe on the Plate of the Glaſs A B. This Glaſs Bell was ſuſpended by a Wooden Circle P Q P Q, to which were faſten'd four Cords, that united into one Knot at R, and from thence went a Rope over a Pulley S, in the Crown of the Machine, and coming down by the Side of one of the Pillars, ſerved to raiſe up or let down the Bell.

At the firſt firing of the *Phoſphorus*, the whole Bell appeared Luminous, and full of Flame for a few Minutes: When the Deflagration of the firſt Spoonful was over, he flung in another, and ſo on, 'till there were two Ounces of *Phoſphorus* conſumed, from which were ſublimed a large Quantity of *Flores* into the Bell, and ſome fell down upon the concave Glaſs A B. The Bell at firſt felt cold, and never grew more than moderately warm. As the *Flores* began to cover the Inſide of the Bell to

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ſome conſiderable Thickneſs, the Flame was not ſeen thorough ſo brightly as before, but the whole appeared of a light Azure, or Sky-colour, which *the Doctor liken'd to the Formation of the Firmament:* The *Flores* ſublimed *he liken'd to Snow.* Then the Bell being drawn up again, and the Golden Baſons taken out, there remained in the ſmaller Baſon an almoſt fix'd red *Earth*, or *Caput mortuum.* On the Admiſſion of the cold Air, the Snow [*Flores*] began ſoon to melt as *per Deliquium*; which *he compared to the Formation of Dew and Rain*; and as it dripp'd from the Inſide of the Bell upon the Concave Plate A B, it ran through the Hole in the Middle of it C, by the Tube C D, into the Receiver E E F; where it was collected in Form of a clear tranſparent Liquor, ſomewhat clammy like Gum-water, which *he called Water.*

Some of the *Flores* mixed with any combuſtible Matter, as common Olive-Oil, *&c.* and put into a Golden Baſon ſet over a Lamp, fired immediately, and flamed like *Phoſphorus*, being, in reality, *Phoſphorus* regenerated, and burnt away to a Subſtance like Tar.

Some of the clammy Water was put into a Golden Baſon ſet on a Lamp, and by augmenting the Fire *per gradus*, in about a quarter of an Hour's time, when all the airy Bubbles were exhaled, the Liquor became hard like Gum, which had been diſſolved in Water, and was nearly dry, and perfectly tranſparent: *This he called Vitrum Molle.*

Next Day he made ſome more of this *Vitrum Molle*, which he put into a Crucible heated red hot, and then ſet it in a Wind-Furnace, and gave it the

greateſt Heat for a quarter of an Hour; when the Matter in the Crucible appeared fluid, like melted Glaſs. He then poured it out into an Iron Pan; the Matter remained red hot ſome time; when it was perfectly cold, it was hard, tranſparent, and brittle like common Glaſs; but it ſoon began to relent, and in twenty-four Hours was almoſt all turned to Water again.

He ſaid, "If this *Vitrum Molle* be again entirely "reſolved in the Air, which will take up near four-"teen Days time, by diſtilling off the Water, and "letting the Remainder melt *per deliquium* again, "'till all the ſaltiſh Matter be reſolved into Water, "there remains an inſipid whitiſh Earth, which "fluxed in a Glaſs-Furnace, gives a true fixed "Glaſs."

II. *An Account of ſome Experiments upon the* Phoſphorus Urinæ, *which may ſerve as an Explanation to thoſe ſhewn to the* Royal Society *by Dr.* Frobenius, *on* November 18, 1731, *together with ſeveral Obſervations tending to explain the Nature of that wonderful Chemical Production, by Mr.* Ambroſe GODFREY Hanckewitz, *Chemiſt, F. R. S.*

I Repeated the Experiment of the Deflagration of *Phoſphorus* under a Bell, which had been firſt ſhewn to the *Royal Society* by Dr. *Frobenius*, but

but I found that a much more ſimple *Apparatus* was ſufficient, than the pompous Machine he made uſe of. I took a ſtrong wide-mouthed Glaſs Jar, which ſerves as a Stand for the Concave Glaſs Diſh to reſt on. In the Middle of the Glaſs Diſh is a Hole communicating with a Pipe, which goes down into the above-mentioned Jar. Inſtead of the Golden Baſons, a *China* Cup a little warmed, ſerves perfectly as well for burning off the *Phoſphorus*: The laſt and main thing is a large Glaſs Bell, which fits nearly cloſe upon the Glaſs Diſh. This Bell may be eaſily lifted off and on with the Hands by an Aſſiſtant, without any Frame or Ropes to ſuſpend it.

I took one Ounce of *Phoſphorus*, which I deflagrated in the ſame manner as is deſcribed in Dr. *Frobenius*'s Experiment, and obtained of the white ſublimed Flowers ten Drachms, that is two Drachms more than the Weight of the *Phoſphorus* before Deflagration: They were ſo very light as to their Volumen, that they juſt filled an half Pint Pot.

The ten Drachms of Flowers being ſet in a cool moiſt Place, expoſed to the Air, did reſolve into a *Liquamen*, weighing four Ounces and two Drachms, which *Liquamen* much reſembles *Ol. Sulph. per Campanam*; but contains an acid Salt, more fix'd in the Fire than any other Salt we know of in Nature, and having many other Properties peculiar to itſelf, which other acid Salts have not.

The *Phoſphorus* receives this fix'd Acid from the Urine only; for the Salt of Urine is ſo fix'd, that upon a live Charcoal with a blowing Pipe it plays and rolls about like Silver upon the Cupel.

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Whereas all other liquid Acids evaporate with Eaſe; this on the contrary is ſo fix'd, as to require a greater Heat for its Evaporation than that which keeps Lead in Fuſion; and the *Phlogiſtick* Part, notwithſtanding its Lightneſs, is ſo intimately and firmly connected with the reſt of its Principles, as to ſuſtain a Degree of Heat equal to that of red hot Iron, during which Heat the Salt ſparkles and emits Flames very bright for a good while, which is very wonderful and agreeable to behold; and this Sparkling being over, it remains red hot in Fuſion, and perfectly tranſparent; and by greater Heat may be vitrified, as will be ſhewn hereafter.

I put the above-mentioned *Liquamen* into a Glaſs Retort, which I ſet in a *Balneum Mariæ*, and diſtilled it to a ſtrong Inſpiſſation. It yielded only an inſipid Phlegm, except that towards the laſt it came over a little impregnated with the Acid, but not ſharper upon the Tongue than as if it had been a Mixture of Vinegar half an Ounce with Water four Ounces.

Then removing the Retort with the inſpiſſated Liquor into a Sand-Furnace, I increaſed the Heat gradually, ſo as to make the Sand and Retort thoroughly red hot, 'till at laſt the Bottom of the Retort was ready to melt; I then left it 'till next Day, when being perfectly cold, I broke the Retort, and found a moſt admirable white Salt at the Bottom, which was ſo united with the Glaſs as not to be ſeparated from it; and ſome was ſpread all over the Retort quite up to the Neck, and, as near as I could gueſs by View, it ſeemed to be as much in Quantity, could I have taken it out to weigh it, as the original *Phoſphorus* from whence it was produc'd: Its Taſte was very

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ſharp and ſaline; but notwithſtanding its great Fixity in having endur'd a melting Heat for ſeveral Hours, it relented again in a moiſt Air, and in a few Days was entirely reſolved into a *Liquamen*.

The *Phoſphorus*, after its Deflagration, leaves an almoſt fix'd red Earth, or *Caput mortuum*, behind it, as is mention'd in Dr. *Frobenius*'s Experiment. Although one would have imagin'd that all the inflamable Parts of the *Phoſphorus* had been burnt off in the firſt Deflagration, which ſeemed very violent, yet this red Earth retains ſo much of an unctious *Phlogiſtic*, that being placed over a red hot Fire, it ſwells up, and keeps in Fuſion a great while, emitting Flames and Flaſhes of Light, ſo long as it is kept upon the Fire; but when cold again, if expoſed to a moiſt Air, it relents and reſolves as the Flowers do: For the acid Salt of the Urine adheres ſo ſtrongly to it, that although it undergoes ſeveral ſtrong Ignitions, it will relent again as often, when ſet in the Air.

I took ſome of the white Salt that ſtuck to the Retort, and in order to try the utmoſt Degree of its Fixity, I put ſome of it into a Crucible, and gave it a vitrifying Heat, in which it remained ſome Hours, but was not yet run to Glaſs, appearing only like a fix'd white Earth as hard as Stone, and ſhining as if it was juſt ready to vitrify; yet it was ſo far fix'd, as not to relent any more in the Air; had no ſaline Taſte, nor was diſſolvible in Water. I therefore took another Portion of the ſame Salt of *Phoſphorus*, which I kept a longer time in the vitrifying Heat, and I found it at laſt run into perfect Glaſs.

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Thus we ſee what a wonderful Subject is *Phoſphorus!* And how ſurpriſing is it that ſuch an inflamable Body, conſiſting of the unctious and acid Parts of the Urine, ſhould thus become Glaſs!

The Concluſion which I muſt now make from this remarkable Experiment is, That here is a perfect Tranſmutation of Bodies; the *Phoſphorus* being tranſmuted into a fine tranſparent Glaſs of a bluiſh green Colour, coming nearer to the Hardneſs of a Diamond than any other Glaſs, and in the ſame Quantity as the *Phoſphorus* at firſt uſed, which, without any Addition, produces this Glaſs Ounce for Ounce. Here I muſt ſtop, having brought theſe wonderful Experiments to a *ne plus ultrà*.

I ſhall add here further, that the crude *Phoſphorus*, without any Deflagration, but only cut very ſmall, or ſcraped fine with a Knife, and laid upon a Glaſs Diſh in moiſt Air, will in about a Week's time reſolve into a *Liquamen* near eight times its original Weight: Which *Liquamen* is the ſame in all reſpects as that which comes from the ſublimed Flowers by Deflagration, and may be vitrified likewiſe. In ſcraping the *Phoſphorus*, take great Care not to do it too haſtily, leaſt by heating it, you ſet it on fire.

Reflections *on theſe* Experiments.

The Chemical *Phoſphorus* being the principal Subject of the 'foregoing Experiments, I ſhall, upon this Occaſion, give ſome Account of what *Phoſphorus* is, and what it chiefly conſiſts of. It is my Opinion, that *Phoſphorus* doth not naturally exiſt

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in Animals by itſelf; but when formed out of Urine, by the Means of Putrefaction and Fire, its principal Contexture is found to conſiſt of a ſubtile Acid concentrated by the Salt of Urine, and of a fat depurated Oil.

Phoſphorus affords us ſo many wonderful *Phænomena*, that to explain them all would take up a large Treatiſe; a perfect *Phoſphorologia*, being what would exceed the Limits of this ſhort Account.

The *Phlogiſtic* Part is ſo ſlightly connected with the other Principles, that the leaſt Motion, Friction or Warmth, ſets it on fire.

The fixed Part ſeems to conſiſt chiefly in the acid Salt of the Urine, which is at firſt ſo intimately concentrated with the *Phlogiſtick* Part, as in Deflagration to be hurried up or ſublimed along with it; yet being by this Operation freed from it, it becomes fix'd, and can by no Degree of Heat be again ſublimed.

Phoſphorus may be called an urinous *Sapo*, or Soap, as it conſiſts of the ſaline and oleaginous Parts of the Urine: But *Phoſphorus* is not to be got in ſo great Plenty out of Urine alone, as when the *Fæces Alvinæ* are elixirated along with it, and then brought to a *Magma* fit for Diſtillation: Nor is there ſo great a Quantity of *Phoſphorus* in the Urine of other Animals, as of Men; nor is it to be got from any Natural Productions, or any Parts of Animals or Vegetables in their crude State, before they have undergone Concoction in the Stomach of an Animal. How far therefore the *Liquor Gaſtricus*, the *Bile*,

and *Succus Pancreaticus* may contribute to the Formation of it, is a Diſquiſition I ſhall not here enter upon, but leave it to the Enquiry of Phyſicians.

In regard of the Parts whereof *Phoſphorus* conſiſts, it may be conſidered as the Soot of a deflagrated Oil; and ſo may every combuſtible Subſtance be look'd upon as a kind of *Phoſphorus*, as conſiſting of inflamable Materials.

Phoſphorus is more immediately compounded of a Salt tending to the Nature of *Sal Ammoniac*, of an urinous Salt, of an Acid, and an oily *Phlogiſton* with a ſubtile Earth; by the Means of theſe Salts exiſting in the Urine, the *Fæces Alvinæ* are the better elixirated, and thoſe Particles extracted which contribute to the forming the *Phoſphorus*. Concerning the Fixity of the urinous Salt, I have ſaid enough already, ſo ſhall not repeat it here. With theſe Salts are very intimately combined in the *Phoſphorus* oleaginous or fat Particles, which are the proper Materials of that ſubtile *Phlogiſton*, the true *Domuncula Ignis*, and indeed the main Conſtituents of the whole Compound.

As for the Preparation of this wonderful Production, it is done by diſtilling the *Saponaceus Magma* in a cloſe Veſſel, with a reverberatory Fire, much ſtronger than that uſed for the Diſtillation of *Aquæ fortis*, or the other Mineral acid Spirits; the reſt of the proper *Encheireſis* belongs only to the Operator to manage *ſecundum Artem*. When this Operation ſucceeds rightly, there comes forth, Firſt, a thick unctuous Oil. Secondly, a more ſubtile

tile Oil, reſembling the *Oleum Philoſophorum*, which is Olive Oil diſtilled from Brick-duſt. Thirdly, The fix'd Acid encloſed in a very ſubtile Acid. Near the End of the Diſtillation comes over that depurated Oil which conſtitutes the inflamable Part of the *Phoſphorus*, which is not raiſed up 'till the laſt, and that by the Continuance of a very ſtrong Reverberatory Fire.

But an Operator that is not well exerciſed in the Degrees of Fire, and doth not know how and when to take away theſe Oils apart, will have nothing but a volatile Salt, and fetid Oil, and get at laſt only a little unctuous opaque *Phoſphorus*; ſuch as the famous *Kunckel*, Dr. *Crafft*, and *Brand* did, as they acknowledge in their Writings; but not our hard tranſparent *Glacial Phoſphorus*. Since *Kunckel* therefore, and his Followers, were never able to make the true ſolid Glacial *Phoſphorus*, it was abſurd for him to write, that he could make it even out of crude indigeſted Things, in their natural State; for either this famous Man ſpoke too much at large, and had never tried the Experiments, or elſe he muſt deſign to impoſe upon the World: For I can boldly contradict him in this Point from the ſeveral Experiments I have made, but never found any true *Phoſphorus* except in ſuch things as had undergone Digeſtion in Animals. And I know my ſelf to have been for theſe forty or fifty Years, that is, ever ſince I left the Laboratory of my Maſter the Honourable Mr. *Boyle*, the only Perſon in *Europe* able to make and produce in any Quantity the true ſolid *Phoſphorus*.

I did not content my ſelf to work upon the *Urinous Sapo* of Man only, but examined likewiſe the Excrements of other Animals; as for Example, of Horſes, Cows, Sheep, *&c.* and got *Phoſphorus*, but not in ſo great Quantities as from Man; probably becauſe they feed on nothing but Vegetables. I then examin'd the Dens of Lions, Tygers, and Bears, making Experiments on their Excrements, and likewiſe on thoſe of Cats and Dogs, which being carnivorous Animals, I obtain'd more *Phoſphorus* thence than from the other Creatures: My Curioſity led me likewiſe to the Rats-Neſts, and Mouſe-Holes, and I had *Phoſphorus* thence. I then addreſs'd my ſelf to the feather'd Tribe, viſiting the Hen-Rooſts, and Pidgeon-Houſes, and got ſome ſmall Matters thence alſo: I emptied the Guts of Fiſh in order to get their Excrements, and had a little *Phoſphorus* from theſe, but none from the Fiſhes by themſelves.

I was next induc'd by *Kunckel*'s Aſſertion to try what I could obtain out of crude Vegetables, *viz.* Corn and other Fruit: I thought that Putrefaction would bring them the nigheſt to an *Ammoniac* and urinous State, becauſe of the Heat that is produced in them by it; but my Labour was all in vain. After theſe Experiments, I took in Hand Foſſils and Minerals: I began with the common Foſſil Coal, thinking that the *Phlogiſton* in this Bituminous Subſtance might have been to my Purpoſe; but I found nothing therein like *Phoſphorus*, there coming over only a Bituminous Oil, and at laſt by encreaſing the Fire to the higheſt Degree, there ſublimed ſome white Talckly Flowers, which were neither Sulphureous,

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nor Acid, nor Alcalick, but inſipid like Talck; ſo I gave up all further Experiments upon other Minerals.

I have often wiſhed for a ſufficient Quantity of the Flies which ſhine in the Dark, whereof there are great Numbers in *Italy*, eſpecially in *Tuſcany*; or of our common Glow-worms, which ſeem to have *Phoſphorus* lodged in their Bodies.

Our *Phoſphorus* is a Subject that occupies much the Thoughts and Fancies of ſome Alchymiſts, who work on Microcoſmical Subſtances; and out of it they promiſe themſelves Golden Mountains. Of this Number was the famous Dr. *Dickinſon*, Phyſician to King *Charles* II: He toiled and laboured many Years in Experiments upon the *Stercus humanum*; and hath ſeveral times with the greateſt Pleaſure ſhew'd me *Metallic Regulus's*, he had extracted from it. This is what I have often done my ſelf, and no Wonder! for we take in daily with our Food, and ſometimes in Medicines, both Mineral and Metallick Subſtances, beſides what Metallick Veſſels, Kettles, Pots and Diſhes furniſh: We ſee a Solution of the Metal upon a Knife after cutting any acid Fruit, by the black Spots it hath upon it, and the metallick Taſte it communicates to the thing it cuts.

Dr. *Liſter* hath ſhewn, that Stones out of the Human Bladder being calcined, Iron may be extracted from them by a Loadſtone. And the *Great Boerhaave* hath made it evident, by various Experiments, that there is ſcarce any terreſtrial Subſtance, either in Men, Brutes or Plants, which after Uſtion doth not exhibit ſome metallick Particles. Dr. *Becher* ſaith, that out of Brick-Earth mix'd with any Fat or Oil, and calcined in the Fire, he hath produced

Iron:

Iron: For it is only the Iron that cauſes the Redneſs of the Bricks, and can be extracted from them again. Moreover, Metals are diſſolved by the Salts and Moiſture in the Earth, and ſo mix with the nutritious Juices of Vegetables; hence it may, in ſome reſpect, be ſaid, that we eat Metals with the greateſt Part of our Food.

Having given the foregoing ſhort Account of the Production of *Phoſphorus*, I ſhall here ſubjoin, that there is produced out of the *Reſiduum*, after the *Phoſphorus* is made, a particular Salt, which I name *Sal phoſphori*, or Salt of *Phoſphorus*. This Salt is fix'd in ſome Degrees of Fire, yet it may be ſublimed in a cloſe Veſſel, which other fix'd Salts cannot be, except they ſtill contain ſomewhat Volatile in them; but this Salt hath no ſuch thing in it, neither is it any ways Alcalick.

How to produce this Salt, remains as much a Secret as the *Phoſphorus* itſelf; for he that cannot produce this Salt will never be able to make *Phoſphorus*.

There is ſcarce any Body, out of which a Chemical Operator cannot produce Water and Earth, Salts, or an acid Spirit, and an urinous Unctuoſity, in more or leſs Quantity, according to the Nature of the Body; and where there is one of theſe, there is Fire to be demonſtrated, but not without each other's Help. The *Encheireſis* of this would be too long for this Place, I ſhall therefore omit it here.

From our Preparation of *Phoſphorus*, we may reflect upon the *Fuligo*, or Soot of all combuſtible Subſtances; for it is the *Phlogiſton* only that burns and produces Flame; it dwells in ſulphureous Bodies,

dies, and unctuous Earths, in Pitch, Roſin, Wax and Oils; and in the Fat of Animals: But the fineſt exiſts in ardent Spirits, which when brought to that ſurprizing Subtilty, as that Liquor deſcribed by Dr. *Frobenius* in Tranſact. N° 413, do truly deſerve the Name of *Æther*.

OBSERVATIONS *on the* PHOSPHORUS.

I. From what hath been ſaid, we ſee that the *Saponaceous Magma* of Urine has great Affinity with common Sulphur; being a ſulphureous Body, compoſed of an acid and depurated Oil, join'd with a ſmall Proportion of Earth.

II. Our *Phoſphoreal Magma* comes very near *Homberg*'s *Pyrophorus*, which wants only the Salt of Urine in it, in the room of which Allum is uſed to fix the Sulphur.

III. We may obſerve hence, that urinous Particles exiſt in greater abundance in Animals; but the *Phlogiſton* abounds moſt in Vegetables, from which is prepared that fine *Æthereal Spirit* ſhewn by Dr. *Frobenius*.

IV. We produce the *Phlogiſton* out of fat Subſtances, and from the *Phlogiſton* a *Fuligo*, or Soot, and from the *Fuligo* an urinous Salt.

V. From the corroſive Oil of Sulphur, we have a pure ſubtile Oil, which is intimately combined with it, and is the actual Fire of the *Phoſphorus*, that by barely rubbing, or the leaſt Degree of Heat, is kindled into Flame.

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VI. He who knows perfectly the Method of making *Phoſphorus*, can chooſe whether he will ſublime his *Magma* of Urine into *Phoſphorus*, or into Sulphur; for the Difference conſiſts only in the *Encheireſis*.

III. *Obſervations of the Appearances among the Fix'd Stars, called* Nebulous Stars. *By* W. Derham, *D. D. Canon of* Windſor, *F. R. S.*

HAVING laſt Autumn made ſome good Obſervations, with my eight Foot Reflecting Teleſcope, of the Appearances in the Heavens, called *Nebulous Stars*, I think it proper to acquaint this Illuſtrious Society with them, to inſtigate others to make farther Obſervations of them, becauſe I think there is much more in them worthy of the Inquiry of the Curious, than hath hitherto been imagined, and becauſe I fear I ſhall not be able to purſue my Obſervations much farther, by reaſon my Reflecter loſeth its Excellence and Power, by beginning to be tarniſhed.

But if any one would have a good View of theſe *Nebuloſæ*, it is of abſolute Neceſſity that he makes uſe of very good Glaſſes, elſe all his Labour will be loſt, as I found by Experience.

Theſe Appearances in the Heavens, have born the Name of *Nebulous Stars*: But neither are they *Stars*, nor ſuch Bodies as emit, or reflect Light, as the

the Sun, Moon, and Stars do; nor are they *Congeries*, or *Clusters* of Stars, as the *Milky-Way*: but whitish *Areæ*, like a Collection of *Misty Vapours*: whence they have their Name.

There are many of them dispersed about, in diverse Parts of the Heavens. This Catalogue of them (which I transcribed from *Hevelius*'s *Prodromus Astronomiæ*) may be of good use to such as are minded to enquire into them.

A CATALOGUE of the *Nebulosæ*, extracted from *Hevelius*.

The Places of the *Nebulosæ*.	Their R. Ascent. *A.* 1660.			Their Declinat. *A. D.* 1660.			
	gr.	′	″	gr.	′	″	
In *Andromeda*'s Girdle,	6	4	45	39	27	57	N.
In Forehead of *Capricorn*,	300	2	53	20	1	53	S.
Another preceding the Eye of *Capricorn*,	301	59	55	19	11	30	S.
Another following it,	302	35	9	19	36	0	S.
One above those, adjoining to the Eye of *Capricorn*,	302	25	31	18	48	58	S.
Preceding above the *Swan*'s Tail, and last in its N. Foot,	304	54	8	47	54	20	N.
One following a Star above the *Swan*'s Tail, out of the Constellation,	312	10	5	53	05	20	N.
On the outside of *Hercules*'s left Foot,	264	52	46	48	9	10	N.
In the left Leg of *Hercules*,	265	38	37	38	5	50	N.

The Places of the *Nebulosæ*.	Their R. Ascent. *A.* 1660.			Their Declinat: *A. D.* 1660.		
	gr.	′	″	gr.	′	″
On the Top of *Hercules*'s Head,	252	24	3	13	18	37 N.
At the Ear of *Pegasus*,	332	38	45	3	3	12 N.
In the Western Border of *Sobieski*'s Shield,	272	32	34	14	23	35 S.
Under the Beam of the Scales of *Libra*,	219	26	15	9	16	27 S.
Above the Back of *Ursa major*,	183	32	41	60	20	33 N.
In the third Joint of *Scorpio*'s Tail,	12	43	00 ↙ Long.	19	1	0 S. Lat.
Between *Scorpio*'s Tail; and the Bow of *Sagittarius*,	24	32	00 ↙ Long.	11	25	0 S. Lat.

Besides these Dr. *Halley*, in *Phil. Trans.* N° 347, hath mentioned one in *Orion*'s *Sword*; another in *Sagittary*; a third in the *Centaur* (never seen in *England*) a fourth preceding the right Foot of *Antinous*; a fifth in *Hercules*; and that in *Andromeda*'s *Girdle*.

Five of these six I have carefully viewed with my excellent eight Foot Reflecting Telescope, and find them to be Phænomena much alike; all except that preceding the right Foot of *Antinous*, which is not a *Nebulose*, but a *Cluster* of *Stars*, somewhat like that which is in the *Milky-Way*.

Between

Between the other four, I find no material Difference, only ſome are rounder, ſome of a more oval Form, without any Fix'd Stars in them to cauſe their Light; only that in *Orion*, hath ſome Stars in it, viſible only with the Teleſcope, but by no Means ſufficient to cauſe the Light of the *Nebuloſe* there. But by theſe Stars it was, that I firſt perceived the Diſtance of the *Nebuloſæ* to be greater than that of the *Fix'd Stars*, and put me upon enquiring into the reſt of them. Every one of which I could very viſibly, and plainly diſcern, to be at immenſe Diſtances beyond the Fix'd Stars near them, whether viſible to the naked Eye, or Teleſcopick only; yea, they ſeemed to be as far beyond the Fix'd Stars, as any of thoſe Stars are from the Earth.

And now from this Relation of what I have obſerved from very good, and frequent Views of the *Nebuloſæ*, I conclude them certainly not to be *Lucid Bodies*, that ſend their Light to us, as the Sun and Moon. Neither are they the *combined Light* of *Cluſters* of Stars, like that of the *Milky-Way*: But I take them to be *vaſt Areæ*, or *Regions of Light*, infallibly *beyond the Fix'd Stars, and devoid of them.* I ſay *Regions*, meaning Spaces of a vaſt Extent, large enough to appear of ſuch a Size as they do to us, at ſo great a Diſtance as they are from us.

And ſince thoſe Spaces are devoid of Stars, and even that in *Orion* itſelf, hath its Stars bearing a very ſmall Proportion to its *Nebuloſe*, and they are viſibly not the Cauſe of it, I leave it to the great Sagacity and Penetration of this Illuſtrious Society, to judge whe-

ther these *Nebulosæ* are particular Spaces of Light; or rather, whether they may not, in all Probability, be Chasms, or Openings into an immense Region of Light, beyond the Fix'd Stars. Because I find in this Opinion most of the Learned in all Ages (both Philosophers, and I may add Divines too) thus far concurred, that there was a *Region beyond the Stars*. Those that imagined there were *Crystalline*, or *Solid Orbs*, thought a *Cœlum Empyræum* was beyond them and the *Primum Mobile*: and they, that maintained there were no such Orbs, but that the Heavenly Bodies floated in the Æther, imagined that the Starry Region was not the Bounds of the Universe, but that there was a Region beyond that, which they called the *Third Region*, and *Third Heaven*.

To conclude these Remarks, it may be of use to take Notice, that in *Hevelius*'s *Nebulosæ*, some seem to be more large, and remarkable than others; but whether they are really so, or no, I confess I have not had an Opportunity to see, except that in *Andromeda*'s *Girdle*, which is as considerable as any I have seen. In his Maps of the Constellations, the most remarkable are the three near the Eye of *Capricorn*; that in *Hercules*'s *Foot*; that in the third Joint of *Scorpio*'s *Tail*; and that between *Scorpio*'s *Tail* and the *Bow of Sagittary*. But if any one is desirous to have a good View of these, or any other of the *Nebulosæ*, it is absolutely necessary that he should make use of very good Glasses, else all his Labour will be in vain, as I have found by Experience, and before noted.

IV. *An Account of some* Magnetical Observations *made in the Months of* May, June *and* July, 1732, *in the* Atlantick *or* Western Ocean; *as also the Description of a* Water-Spout, *by Mr.* Joseph Harris. *Communicated by Mr.* George Graham, F. R. S.

THE Knowledge of the Magnetical Variation is of such Consequence to the Mariner, that without it he cannot know his Course; and were the Theory thereof once established, it might be of great use for estimating the Longitude in several Parts of the World, as has been often and very justly observed by others. But 'till this be determin'd, we must rely upon Observations.

I sometime since took notice of the Imperfections of the common Azimuth Compass, and how ill adapted that Instrument is for the Purpose intended. I also gave the Description of a new Instrument, whereby I proposed to remedy the principal Objections to the former; and farther Experience has sufficiently confirmed me in what I have said. But I should be glad to have it determined by those who have convenient Opportunities of making Experiments of this kind, what would be the propereſt Diameter and Weight for a Needle and Card, and what ought to be their proportional Weights to each other when taken separately: Regard being had that the Friction be-

be no more than what is neceſſary to prevent the Card from being too much affected by the Motion of the Ship. Some Obſervations incline me to think, that a Sea-Card ſhould not exceed ſix Inches Diameter, and that moſt of thoſe generally uſed, are too heavy for nice Experiments, tho' they may be well enough adapted for common Purpoſes.

In the Months of *March* and *April*, 1732, the Variation at *Black-River* in *Jamaica*, was very accurately obſerved to be from 6° to 6° 05′ Eaſterly.

Off the *Havanna* about 4 ½ Deg. Eaſterly.

The reſt of the Obſervations I made, are expreſſed in the following Table.

Latitude. N.		Longit. from *London*, W.		Variat.	Latitude.		Longit. from *London*, W.		Variat.
Deg.	Min.	Deg.	Min.	Deg.	Deg.	Min.	Deg.	Min.	Deg.
27	00	80	00	4 E.	35	55	65	30	5 W.
28	45	80	00	3 ½	38	06	60	30	6 ½
31	00	77	45	1 ¾	39	10	57	30	8 ⅓
32	15	72	30	00	39	40	56	30	8 ¾
32	40	72	00	1 W.	43	00	45	00	9 ½
32	45	71	30	1 ½	43	05	44	35	9 ½
32	52	70	40	2 ¼	44	40	35	15	11 ½
34	30	67	25	4 ⅓	47	20	20	20	11

The Inſtrument I uſed was ſo eaſily managed, that unleſs the Sea was pretty rough, an Obſervation might be depended upon to about a quarter of a Degree, had the Card performed to the ſame Exactneſs. But by comparing ſeveral Obſervations made under the like

like Circumſtances, as to the Weather, it ſeems to me as if the Virtue of the Needle was not always of equal Strength. Sometimes ſeveral Obſervations would agree exceedingly well; at other times the Card would ſtand indifferently any where within a Degree or more of its Meridian; and this I obſerv'd in ſeveral Cards. I found another Circumſtance which ſurprized me much: The Card would ſometimes differ about two Degrees from it ſelf betwixt the Morning and Evening of the ſame Day; and this Difference would continue as it were regularly for ſeveral Days, then vaniſh for a Week or more, and afterwards would return and continue as before.

The greatneſs of this Difference, and the near Agreement betwixt the Obſervations made in the ſame Forenoon, or Afternoon, amongſt themſelves, will not give me room to ſuſpect that it proceeded altogether from an Error in obſerving. I own I cannot account for it, but whatever be the Cauſe thereof, the Error was always the ſame way; that is, the Weſterly Variation in the Morning would be leſs than in the Afternoon. I carefully examined if this could be any ways owing to the Inſtrument, or to any Iron near the Place where it was uſually ſet for Obſervation; but I was fully convinced it could proceed from neither. I know not whether any ſuch Obſervations as theſe have been made before; but I think it would not be unuſeful, if thoſe who have proper Inſtruments, and are ſufficiently skilled, would communicate any thing of this kind that may occur.

It now appears that the Numbers in the foregoing Table cannot be ſtrictly accurate; but I think the Error can ſcarce any where exceed half a Degree; for

in

in moſt Caſes ſeveral Obſervations were made pretty near together, of which I took a Medium, making Allowances according to the Circumſtances attending each: And perhaps they are as exact as can be well expected from Sea-Journals. And there can be no ſenſible Error as to Longitudes, our Reckoning, when we made the Land, happening to fall out to a more than uſual Exactneſs. I ſhall take another Opportunity to communicate ſome *Magnetical Obſervations* made with great Care at *Jamaica*.

To this I ſhall add the Deſcription of a *Water-Spout*, which we ſaw about Sun-ſet, *May* 21ſt, 1732, in the Latitude 32° 30′ N. and Longitude 9° Eaſterly from the Meridian of Cape *Florida*. *Vide* TAB. *Fig.* 2.

When firſt we ſaw the *Spout*, it was whole and entire, and much of the Shape and Proportion of a Speaking-Trumpet (as expreſſed by the Figure annexed) the ſmall End being downwards, and reaching to the Sea, and the big End terminated in a black thick Cloud. The Spout itſelf was alſo very black, and the more ſo the higher up. It ſeemed to be exactly Perpendicular to the Horizon, and its Sides perfectly Smooth, without the leaſt Ruggedneſs. Where it fell the Spray of the Sea roſe to a conſiderable Height, which made ſomewhat of the Appearance of a great Smoak.

From the firſt time we ſaw it, it continued whole about a Minute, and 'till it was quite diſſipated about three Minutes. It began to waſte from below, and ſo gradually up, whilſt the upper Part remained entire, without any viſible Alteration, 'till at laſt it ended in the black Cloud above. Upon which there

ſeemed

ſeemed to fall a very heavy Rain in that Neighbourhood. As it waſted, the Bottom of the remaining Part was irregular, ſomewhat like the Trunk of a Tree broke aſunder: There was but little Wind, and the Sky elſewhere was pretty ſerene. We judged the Spout to be above two Leagues off, and I think the Angle under which the ſmall End appeared, muſt be at leaſt 20 Min. According to which Eſtimation, the Thickneſs of it muſt be upwards of 60 Yards, and its Height or Length about three quarters of a Mile.

V. HISTORIA TERRÆMOTUS Apuliam *& totum ferè* Neapolitanum *Regnum, Anno* 1731, *vexantis. A* Nicolao Cyrillo, *in Regiâ Univerſitate* Neapolitanâ, *Pr. Med. Prof. & R. S. S.*

SCIENTIÆ Naturalis incremento, adeoque noſtræ Societatis Inſtituto valde conſentaneum exiſtimavi, ſi Terræmotûs, qui hoc Anno Apuliam, & ferè univerſum hoc Regnum ſæpè ſuccuſſit, Hiſtoriam hîc attexerem. Rei accidentia Felici Roſeto Medicinæ & Philoſophiæ Doctori, atque in Mathematicis diſciplinis & Humanioribus literis non mediocriter erudito, olim meo Diſcipulo, nunc in eâ Regni regione Medicinam facienti, debeo : ex cujus atque aliorum, & Juvenatij, & Foggiæ degentium Obſervationibus brevem Synopſim concinnabo.

Die 9 Martij Anni 173$\frac{0}{1}$, St. Vet. h. 4, ante meridiem, Terræmotus ferè per totum Regnum Neapolitanum factus eſt : in Apuliâ maximus. In ejus duratione omnes illius ſpecies ab Antiquis notatæ obſervatæ fuere. Tremor primùm ; hinc Pulſus (σφυγμὸς) ut loquitur Ariſtoteles, ſeu ſuccuſſatio, ut illam vocat Poſidonius ex Seneca ; ac demum Inclinatio, ſeu Terræ veluti more navigij nutatio. Hi varij motus per vices & ſucceſſivè ſe excipiebant, ſpatio trium primorum minutorum, & aliquot quoque ſecundorum. Haud ab Amico notatum fuit, num Terræ nutationes & oſcillationes ſecundùm circulos Terræ parallelos factæ fuerint : quemadmodùm conſtans eſt recentiorum Philoſophorum ejus phænomeni, ad Terræ motum diurnum ſtabiliendum quammaximè facientis, obſervatio. Id ſanè à me quoque atque aliis, tum in hôc, tum in aliis Terræ nutationibus, animadverſum attentè eſt.

Aër tunc temporis craſſis humilibus & immotis Nubibus prægravabatur quæ leni poſtmodùm flante Boreali vento diſſipatæ ſunt. Succedentis diei Sol languidius irradiabat, veluti ſi à tenuiſſimis Nubibus contectus eſſet : hæ verò in Cœlo cæteroqui ſereno non conſpiciebantur. Hoc phænomenon in fortioribus ſequentibus Terræmotibus itidem obſervatum. Piſcatores qui tunc temporis ad maris oram pervigilabant ſuo incumbentes artificio, mare repente intumeſcere adnotârunt, atque tempeſtatem Siponto & Barletio (nempe è Boreali ferè regione) abſque vento, ſed non ſine naufragij metu adventantem ſuſtinuêre.

Sequenti die, nempe 10 Martij horâ 8, a. m. novus ſed brevior iſque debilior Terræmotus, in eâdem Regni Provinciâ accidit : (non adeò tamen debilis quin

quin etiam hîc Neapoli obſervatus fuerit). Hunc præceſſit Accenſio quædam, ſeu brevis Coruſcatio circa montem Garganum à Barenſis Provinciæ incolis viſa, quæ in fumum vel caliginem abiens ſenſim diſparuit. In regione circa Foggiam hunc ſecundum, ut & alios deinceps factos, Menſe Aprili, Octobri, & Novembri, ſed per intervalla, Terræmotus, plerumque præceſſit validus NE; etſi quandoque Aër omninò immotus fuerit.

Ædificiorum ruina atque hominum ab iis oppreſſorum ſtrages haud mediocris: numerantur enim inter mortuos ad ſexcentos plùs minus.

Centrum veluti harum ſuccuſſationum viſum eſt Oppidum Foggia appellatum: in eo enim immaniores motus & ruinæ, è quo in remotiora loca, ſenſim ſe remittente impetu, diffundebantur: ita ut dici poſſit, Motûs hujus propagationem ſucceſſivè imminutam eſſe (niſi quid varia Terræ interjacentis ſoliditas & interruptio immutaverit) in ratione duplicata diſtantiarum: juxta familiares, etiam in aliis Motuum ſpeciebus Naturæ Canones.

Quod & in Pendulorum in variâ à Foggiâ diſtantiâ locatorum Oſcillationibus, à duobus Obſervatoribus, ex condicto in id incumbentibus, attentè notatum eſt. Pendula enim palmaris longitudinis, Aſculi, & Juvebus, ad ſemirculum in gradus diviſum applicata, atque in Terræ quaſſationibus ſe moventia, pluribus, vel paucioribus gradibus à centro Oſcillationum aberrabant, pro minori, vel majori à Foggiâ intervallo. Numerus enim horum graduum major in Oppido Aſculo vicíniore, minor in Urbe Juvenatio remotiore, ferè reſpondebat duplicatæ rationi diſtantiæ horum locorum à centro Terræmotûs. Atque hinc quoque

factum fuit, ut cùm Foggiæ Terra leviſſimè intremiſceret, Pendulum leviter moveretur Aſculi, immotum obſervatum fuerit Juvenatij.

In omnibus Terræ ſuccuſſationibus, ferè per annum factis, id conſtanter in apertis campis notatum eſt, quòd illas Aëris fragor, horriduſque rumor præceſſerit: quod & in Plinio legimus lib. 2. 80, notante, quòd Terræmotus quandoque terribiles ſoni, mugitus, clamores humano ſimiles præiverint. Hic Aëris fragor contrariâ determinatione diffundebatur: ut quemadmodùm Terræ partes quatiebantur, motu à centro, ut dictum eſt undique ad circumſtantia loca communicato; ſic contra Aëris motus à circumferentiâ veluti ad centrum non obſcurâ vi concurrebat. Quod quidem phænomenon haud levem philoſophandi materiam Naturæ ſcrutatoribus præbuerit: id tamen è re meâ non eſſe exiſtimo. Notaverim tantùm hoc aliud eſſe ab eo quod Ariſtoteles putabat in Meteoris, ad Terræmotum nempe in ſubſidium advocari debere Ventum exteriorem: ut eo autore Achaiæ ora commota ſit Aquilone & Auſtro confligentibus. Ni dicere fortaſſe velis, ut quidam ſuſpicati ſunt, leves ſaltem & oſcillantes Terræmotus, qui poſt fortes Orientales Ventos facti ſunt à retardato Terræ motu diurno, ſaltem in eo tractu quo Ventus flaverit, oriri potuiſſe. Sed hæc obiter.

Poſtremò & illud de noſtro Terræmotu notatu dignum eſt, quòd prope ruſticum Cartuſianorum prædium, *Tre Santi* appellatum (cujus domus à primo Menſis Martij Terræmotu ſolo æquata fuit) eo loco quo magis deprimitur Torrentis *Fontana del Peſce* nuncupati alveus, nova erupit copioſæ, turbidæ ac calidæ Aquæ ſcaturigo. Hoc ſanè haud novum, nec Anti-

quis

quis ignotum : ſiquidem ex illorum monumentis eruimus, Aquas erumpere dehiſcente corpore Terræ, eo modo, quo Aqua in navim per fiſſuras ingreditur : imò per hiatus hos non tenues tantum Fontes, ſed Diluvia effuſa, Urbeſque ſubmerſas referunt. Quod iis veroſimilius videri poterit, qui cum Thalete, referente Senecâ, putaverint, Terram Aquis ſuſtentatam navigii inſtar interdum fluctuare. Sed hæc iis, qui rectam veramque Terraquei Globi ſtructuram callent, abſurda videbuntur.

Aqua, quæ in deſcripto Apuliæ loco eruperat, ſenſim exiccari cœpit, ac menſis ſpatio omninò evanuit : ſiccum verò ſabulum, etiam ad aliquod tempus, ſulphuris odorem conſervavit. Sic Plinius l. 31. 4. ait : Terræ quoque motus profundunt ſorbentque Aquas. Quare haud mirabimur lacus, fontes, aut fluvios, ubi priùs non fuiſſent, enatos narrari, ubi priùs fuiſſent, exaruiſſe.

Puteos quoque minùs profundos Aquam ex patulo ore, primi Terræmotûs tempore, evomuiſſe, conſtantiſſima fama eſt. Minimè tamen credendum, ex maximâ Terræ ſuccuſſatione Aquam exiliiſſe (hoc enim haud accidere potuiſſet abſque Neapolitani ſaltem Regni ſubverſione, integrâque ruinâ) ſed fortè ex eo quòd nova Aqua in Puteorum illorum fundo, quemadmodum in aliis locis, exurgens, ac eorundem cavitatem complens, extorſùm exturbata fuerit.

Aqua denique, quæ, ut prius narratum, prope *Tre Santi* eruperat, ad examen revocata hæc phænomena præ ſe tulit.

I. Ea ſub eâdem mole cum Aquâ pluviâ comparata, atque ad Aræometrum exacta, hujus pondus ſuperabat,

perabat, eâ proportione, ut hæc libræ pondus æquaret, illa libram cum granis 82 penderet: Aquam verò fontanam, quæ illic ſubſalſa eſt, eâdem quantitate granis tantùm 15 ſupera ret.

II. Ejuſdem Aquæ libra ad ſiccitatem deſtillata ſemidrachmam corporis ad Croci Martis naturam vergentis, ſcrupulo uno albæ & inſipidæ Terræ aſperſi, in vaſis fundo reliquit. Ex hoc Pulvere priùs exiccato Magnes admotus particulas quaſdam rubeſcentes elicuit. In deſtillationis opere Sulphuris odor adſtantium nares ſatis apertè feriebat. Hinc poſt celeberrima Cl. Lemery experimenta, nova argumentorum acceſſio, ſubterraneos Ignes, atque Vulcanos, ex Sulphuris ac Ferri permiſtione facilè accendi poſſe: atque adeò Terræmotus ex abſconditorum Ignium ſucceſſivâ ſuccenſione excitari.

III. Demum: in libras duas illius Aquæ drachmæ tres Gallarum (quas *di Levante* appellamus, quibuſque utimur ad Atramenti confectionem) in tenuiſſimum pulverem redactarum infuſæ poſt quartam horam, Aquam levi cœruleo colore inficere cœperunt, ſequente poſtmodùm Pulveris præcipitatione.

Hæc eſt accurata & verior noſtri Terræmotûs Hiſtoria, reſectis iis, quæ in magnis hiſce calamitatibus per vulgi ora præ timore ferè inſani increbreſcentia, hyperbolen, nî dicam fabulam, ſapere conſuevere.

VI. *Ob-*

VI. *Obſervatio Ecclipſeωs* Lunaris Romæ *habitæ Die* 1 Decembris, 1732, *in Ædibus Eminentiſſ. de VIA, à* D. Didaco Revillas. *Abbate* Hieronymiano, *Abbate* Joanne Botrario, & Euſtachio Manfredio.

OBSERVATIONES HABITÆ *Teleſcopio Palmorum* 10.

Temp. Ver. poſt meridiem.

H.	′	″	
8	45	28	Penumbra jam ſenſibilis.
	49	14	Penumbra denſior.
	51	19	Initium Eclipſeωs.
		44	Grimaldus mergi incipit.
	52	47	Totus latet.
		54	Galilæus
	53	48	Umbra ad Gaſſendum.
	56	2	Totus latet Gaſſendus.
	57	23	Schikardus.
9	2	43	Keplerus.
	4	53	Ariſtarchus totus latet.
	5	0	Lansbergius, & Mare Humorum ferè totum latet.
	6	13	Bullialdus.
		53	Capuanus.
7	8		Umbra ad Mare nubium.
8	2		Copernicus mergi incipit.
	29		Per medium Copernici.
10	27		Umbra ad Eraſtothenem ; & Copernicus totus latet.

H.	′	″	
9	14	12	Tycho mergi incipit.
		45	Insula sinus medii.
	15	37	Heraclides.
	16	22	Tycho jam latet.
	18	12	Tymocharis.
	20	4	Archimedes.
	21	4	Harpalus.
	23	10	Manilius.
		16	Helicon.
		40	Plato.
	26	21	Menelaus.
	28	55	Catharina, & Cyrillus.
	30	11	Plinius.
		56	Dionysius.
	32	31	Aristoteles.
	33	11	Promontorium Acutum.
	34	27	Fernelius.
	35	51	Snellius.
	36	11	Possidonius.
		41	Petavius.
	37	45	Promontorium somnij.
	38	25	Langrenus.
	40	24	Hermes.
	41	0	Proclus.
		30	Incipit Mare Crisium.
	42	32	Cleomedes.
	45	10	Umbra per medium Maris Crisium.
	46	20	Messala.
	48	24	Totalis immersio.
☽	57	5	*Totalis immersionis duratio.*

H.	′	″	
11	31	13	Procul dubio emerſio jam cæperat?
	33	13	Grimaldus emerſerat.
	46	3	Medium Copernici.
	51	17	Tycho.
		52	Plato.
	53	13	Archimedes.
	56	36	Inſula ſinus medij.
	59	57	Eudoxus.
12	2	10	Manilius.
	3	26	Ariſtoteles.
	4	25	Menelaus.
	8	11	Poſſidonius.
	13	6	Plinius.
	17	14	Promontorium Acutum.
	20	38	Langrenus.
	23	21	Totum Mare Criſium.
	26	55	Finis.

Duratio totius Eclipſeως H. 3 35′ 36″.

PHASES NONNULLÆ IMMERSIONIS. *Ex alia Obſervatione habita Teleſcopio* Newtoniano.

Temp. Ver. P. M. H.	′	″	
8	50	13	Penumbra denſa.
	51	28	Initium certum obſcurationis.
	54	8	Grimaldus latet totus.
		32	Umbra per medium Galilæum.
9	0	58	Totus Keplerus latet.
	2	18	Umbra ad Ariſtarchum.
	3	37	Totus Ariſtarchus latet.

H.	′	″	
9	8	3	Umbra ad initium Copernici.
	9	20	Per medium Copernici.
	10	32	Totus Copernicus tegitur.
	14	47	Umbra ad initium Tychonis.
	23	11	Ad initium Manilij.
		26	Ad initium Platonis.
		55	Umbra per medium Platonis, & Manilij.
	24	40	Totus Plato tegitur.
	39	35	Umbra ad initium Procli.
	40	18	Umbra ad Hermetem.
	41	0	Totus Proclus tegitur.
		31	Ad initium Maris Crisium.
	44	20	Per medium Maris Crisium.
	46	15	Totum Mare Crisium obumbratur.
	49	3	Totalis Lunæ immersio in Umbrâ.

VII. *An Eclipse of the Moon observed in* Fleet-street, London, Nov. 20, 1732, *at Night, by Mr.* Geo. Graham, *F. R. S.*

	h.	′	″	
The Beginning at	8	1	30	apparent Time.
Immersion	8	59	30	
Emersion	10	38	00	
End	11	37	00	

Observed with a small Telescope about 18 Inches long, which magnifies about 13 times.

N. B. Mr. *Hodgson* at *Christ's-Hospital*, with a 4 Foot Telescope, observed the Beginning at 8 H. 1′ ½, and the End 11 H. 36′ ½.

VIII. *The*

VIII. *The Bills of* Mortality *for the Town of* Dreſden, *for a whole Century, viz. from the Year* 1617 *to* 1717, *containing the Numbers of Marriages, Births, Burials, and Communicants. Communicated by Sir* Conrad Sprengell, *M.D. F. R. S.*

The Year	Couples married.	Chriſtned.	Buried.	Communicants.	Who receiv'd Holy Orders.
1617	126	478	639	21507	among whom were 37
1618	175	466	400	22567	31
1619	148	530	332	23221	34
1620	119	546	472	22850	36
1621	146	546	491	23988	18
1622	144	521	381	24032	16
1623	127	541	421	25864	20
1624	146	576	411	25899	15
1625	141	543	481	26319	21
1626	151	580	407 beſides 333 who died of the Plague.	29201	27
1627	162	548	412	26677	29
1628	124	543	469	27085	17
1629	136	599	398	28525	18
1630	115	599	480	28446	28
1631	163	599	844	30241	23
1632	161	515	3129 during the Troubles of the War and Plague.	32416	46
1633	412	425	4585 the Troubles of War and the Plague ſtill continuing.	27688	57
1634	346	531	721	23165	47

The Year	Couples married.	Chriſtned.	Buried.	Communicants.	Who receiv'd Holy Orders.
1635	205	523	597	24942 among whom were	24
1636	153	531	594	23904	26
1637	156	613	1897 the Plague breaking out again.	28888	19
1638	205	550	531	26744	43
1639	122	602	1845	28702	24
1640	192	451	935	26032	30
1641	144	509	525	25662	22
1642	155	514	601	27247	20
1643	137	623	1041	28720	30
1644	128	561	489	27677	28
1645	118	497	532	27602	22
1646	134	512	481	27996	9
1647	148	655	471	36619	21
In which Year they began to deliver in the Number of Communicants at *Old Dreſden.*					
1648	190	714	606	37097	23
1649	179	664	597	39198	21
1650	197	752	494	39588	26
1651	199	713	511	39773	19
1652	206	732	450	40389	24
1653	193	673	535	40924	20
1654	194	691	558	41789	28
1655	180	725	525	40253	26
1656	212	708	560	43086	15
1657	163	610	663	44783	30
1658	186	707	518	43117	16
1659	193	703	599	43297	29
1660	219	738	542	45111	23
1661	196	709	649	45137	28
1662	180	733	637	45313	27
1663	193	640	620	45640	31
1664	176	682	662	46115	42
1665	228	734	699	46667	33

The

The Year	Couples married.	Christned.	Buried	Communicants	Who receiv'd Holy Orders.
1666	188	699	824	47194 among whom were 5	32
1667	247	754	823	47325	20
1668	237	739	703	48403	17
1669	215	833	794	48765	27
1670	251	802	776	50121	22
1671	262	844	743	51500	26
1672	275	856	909	51650	32
1673	252	891	909	52483	26
1674	256	887	846	52636	19
1675	257	920	947	53179	25
1676	260	895	1284	51164	28
1677	322	988	887	53079	31
1678	204	1028	1020	53510	22
1679	308	1063	975	55296	30
1680	247	883	1311 besides 5103 who died of the Plague	56116	18
1681	531	791	753	45244	18
1682	386	1137, among whom two Blackmoors Children.	1023	51512	21
1683	256	1201	1200	52493	29
1684	270	1039	1154	48855	21
1685	273	984	937	50931	32
1686	244	1020	1199	53754	31
1687	285	1078, among whom a *Turkish* Woman.	927	49040	35
1688	274	1062, among whom 1 *Turkish* Woman, 3 *Turkish* Girls, and 1 *Turkish* Man.	1011	54868	23

The

The Year	Couples married.	Christned.	Buried	Communicants.	Who receiv'd Holy Orders.
1689	244	1022	1163	55284	among whom were 21
1690	370	1002, among whom 1 *Turk.*	1200	57130	26
1691	306	1119, among whom 4 *Turkish* Women, 2 *Turkish* Boys, and 1 Black Woman.	1166	56629	33
1692	323	1003, among whom 1 *Jew.*	999	58995	18
1693	309	1096, among whom 1 *Turkish* Man.	1071	59921	29
1694	366	1014, among whom 2 *Turkish* Boys.	1426	61288	28
1695	329	1225	1227	62230	35
1696	293	1162, among whom one Black Man.	1055	64491	23
1697	480	1206	1070	61171	30
1698	332	1007	919	59030	25
1699	295	963, among them one Black Woman and a *Lapland* Man 80 Years old.	1139	59662	38
1700	292	975, among them 1 *Turkish* Woman, 2 *Turkish* Men and a *Jew.*	1198	59369	28
1701	324	991	992	61176	27
1702	210	1086, among whom a *Jewess.*	946	60225	27
1703	288	1049, among whom a *Turkish* Woman.	1078	62636	31
1704	279	1111, among whom a Black Woman.	964	62971	39
1705	354	1044, among whom a *Jew.*	1346	64262	30

The

The Year	Couples married.	Chriſtned.	Buried	Communicants.	Who receiv'd Holy Orders.
1706	313	1104	1098	63894 among whom are •	19
1707	296	1034	1523	63120	24
1708	350	1256	1119	66519	30
1709	348	1141, among whom a *Jew* and his Wife.	1340	67021	41
1710	337	1141, among them 2 *Jews*, who apoſtatiz'd afterwards.	1214	69197	24
1711	313	1181	1222	70123	29
1712	354	1227	1140	72432	22
1713	353	1112, among whom one *Turkiſh* Man, and one *Jew*.	1383	71600	23
1714	306	1312, among whom a *Jew*.	1250	75547	33
1715	349	1249, among whom a *Jew*.	1353	76155	23
1716	361	1339, among whom one Black Man, one *Jew*, and one *Jewiſh* Girl.	1274	77146	27
1717	397	1443, among whom a *Jew*.	1908	78019	19

Sum Total from 1617 to 1717 incluſive.

Married 24294 Couples, Chriſtned 83412, Buried 98611. Communicants 4654064, among whom 1686 who received Holy Orders.

IX. *The*

IX. *The Bills of* Mortality *for the Imperial City of* Augsburg, *from the Year* 1501 *to* 1720 *inclusive, containing the Number of Births, Marriages, and Burials. Communicated by the same.*

N. B. *The Years marked* ✝, *denote the Time of Plague, or Contagious Distempers.*

	The Year	Born.	Couples married.	Died		The Year	Born.	Couples married.	Died.
	1501	1764	643	1982		1523	1822	382	1970
	1502	1984	440	1543		1524	1824	392	1989
	1503	1764	542	1646		1525	1827	435	1515
✝	1504	3048	985	4765		1526	1829	436	1418
✝	1505	2464	648	3564		1527	1833	438	1522
	1506	1974	764	1950		1528	1763	439	1632
	1507	1876	665	1754		1529	1783	440	1733
	1508	1764	444	1844		1530	1973	442	1893
	1509	1878	347	1764		1531	1853	445	1763
	1510	1976	765	1979		1532	1640	562	1543
✝	1511	2897	896	4870		1533	1765	573	1172
✝	1512	1768	786	2980		1534	1985	583	1282
	1513	1875	760	1960	✝	1535	1410	593	13000
	1514	1985	645	1740	✝	1536	1515	770	1492
	1515	1895	692	1622		1537	1519	784	1462
	1516	1470	410	1732		1538	1518	636	1565
	1517	1890	419	1893		1539	1922	639	1575
	1518	1980	418	1872		1540	1842	645	1585
	1519	1760	419	1893		1541	1283	496	1208
	1520	1542	320	1760		1542	1439	507	1472
✝	1521	2970	322	3895		1543	1282	660	1283
	1522	1765	372	1980		1544	1473	887	1179

The

	The Year	Born.	Couples married.	Died
	1545	1483	440	1065
	1546	1603	370	1356
✠	1547	1646	630	3480
	1548	1705	492	1227
	1549	2038	819	1757
	1550	1205	411	1490
	1551	1867	360	1455
	1552	1567	417	1477
	1553	1677	498	1665
	1554	1270	445	1464
	1555	1497	526	1340
	1556	1587	447	1239
	1557	1520	417	1310
	1558	1670	488	1485
	1559	1763	467	1555
	1560	1297	613	1990
	1561	1150	488	1310
	1562	1717	454	1744
✠	1563	1869	460	2680
✠	1564	1872	536	2542
	1565	1779	538	1488
	1566	1861	418	1518
	1567	1723	424	1718
	1568	1757	440	1703
	1569	1838	446	1396
	1570	1884	334	1640
✠	1571	1521	318	3071
✠	1572	1634	650	3306
	1573	1629	549	1371
	1574	1488	382	1520
	1575	1563	384	1595
	1576	1647	442	1245
	1577	1721	386	1427
	1578	1687	403	1410
	1579	1629	388	1520
	1580	1635	416	1522
	1581	1477	456	1185
	1582	1627	414	1536
	1583	1497	452	1245
	1584	1614	311	1167
✠	1585	1568	435	2497
✠	1586	1583	526	3136
	1587	1541	578	1545
	1588	1583	420	1468
	1589	1664	426	1372
	1590	1592	405	1678
✠	1591	1520	410	1352
✠	1592	1632	363	3450
	1593	1581	649	1554
	1594	1629	396	1560
	1595	1517	335	1584
	1596	1639	437	1505
	1597	1608	393	1594
	1598	1552	380	1631
	1599	1486	386	1447
	1600	1621	499	1775
	1601	1575	387	1570
	1602	1468	453	1567
	1603	1570	390	1488
	1604	1551	394	1298
	1605	1272	394	1361
	1606	1587	376	1371
✠	1607	1577	361	2595
	1608	1526	578	1476
	1609	1648	477	1469
	1610	1618	435	1941
	1611	1557	466	1891
	1612	1596	410	1625

The Year	Born.	Couples married.	Died
1613	1572	437	1722
1614	1713	404	1444
1615	1460	368	1771
1616	1591	446	1631
1617	1655	429	1514
1618	1824	414	1354
1619	1688	419	1485
1620	1725	463	1667
1621	1661	443	1517
1622	1696	435	1959
1623	1374	451	1875
1624	1512	383	1370
1625	1482	386	1392
1626	1431	299	1440
1627	1198	313	2494
1628	1106	411	9611
1629	1121	860	1265
1630	1052	272	909
1631	1173	169	859
1632	1286	355	3485
1633	1075	537	3364
1634	1054	299	4664
1635	512	416	6243
1636	789	440	790
1637	801	213	823
1638	809	209	638
1639	811	239	674
1640	843	217	586
1641	843	176	587
1642	832	248	593
1643	839	194	638
1644	841	189	659
1645	904	172	758
1646	1221	206	1488

The Year	Born.	Couples married.	Died
1647	944	256	1338
1648	1482	225	1208
1649	776	233	940
1650	639	191	533
1651	665	190	577
1652	692	178	616
1653	686	150	575
1654	694	197	764
1655	680	158	570
1656	700	182	641
1657	675	182	731
1658	659	198	731
1659	687	187	831
1660	657	211	657
1661	710	179	668
1662	644	192	788
1663	675	207	836
1664	687	224	761
1665	624	272	745
1666	690	209	737
1667	754	193	769
1668	688	228	711
1669	793	192	743
1670	707	228	734
1671	810	210	733
1672	830	197	768
1673	786	239	751
1674	874	251	842
1675	775	201	913
1676	805	230	913
1677	843	224	934
1678	854	239	943
1679	861	250	945
1680	807	281	976

The

The Year	Born.	Couples married.	Died		The Year	Born.	Couples married.	D
1681	888	214	860		1701	933	230	906
1682	891	214	734		1702	952	249	900
1683	892	195	808		1703	989	190	1245
1684	894	234	858	✠	1704	818	339	3113
1685	885	230	848		1705	890	405	748
1686	910	247	981		1706	949	307	842
1687	853	281	855		1707	1013	240	805
1688	927	231	860		1708	916	225	908
1689	853	213	806		1709	948	240	805
1690	911	262	1071		1710	982	238	811
1691	825	253	785		1711	899	243	855
1692	893	202	935		1712	911	229	894
1693	818	219	1084		1713	837	202	860
1694	760	277	1106		1714	874	261	948
1695	867	262	1048		1715	866	309	1024
1696	930	274	927		1716	997	272	905
1697	969	271	777		1717	924	259	988
1698	1020	241	879		1718	986	280	768
1699	1008	268	940		1719	924	270	997
1700	909	217	786		1720	909	263	934

X. *Re-*

X. *Remarks upon the aforeſaid Bills of* Mortality *for the Cities of* Dreſden *and* Augsburgh. *By Mr.* William Maitland, *F. R. S.*

BY the firſt Septenary of the Centenary of the Bills of Mortality for the City of *Dreſden*, from the Year 1616 to *Anno* 1624, it appears, that there died in that Electoral Capital 3136 Perſons; and in the laſt Septenary of the ſaid Centenary, from *Anno* 1709 to 1717, 8836.

And by the firſt Septenary of the ſame Centenary of the Bills of Mortality of the Imperial City of *Augsburgh*, from the Year 1616 to *Anno* 1624, it appears that there died in that City 11371; and in the laſt Septenary, from 1709 to *Anno* 1717, only 6297; whereby is evinc'd the great Viciſſitudes of ſublunary Affairs, in the vaſt Diſparity between the aforeſaid Cities; for as the former has increaſed near two Thirds in the Number of its Inhabitants, ſo hath the latter decreaſed near one Half in the ſaid Space of Time.

F I N I S.

E R R A T A.

NUMB. 427. Tit. IV. for *Muro Pontico*, r. *Mure Pontico*. Ib. P. 32. Tit. IV. the ſame.

Numb. 429.

PHILOSOPHICAL TRANSACTIONS

For the Months of *July*, *Aug.* *Sept.* and *Oct.* 1733.

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II. *An Abstract of the* Meteorological Diaries, *communicated to the* Royal Society, *with Remarks upon them. By* Wm. Derham, *D. D. Canon of* Windsor, *and F. R. S.* PART II.

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IV. *An Observation of the* Eclipse *of the* Sun *on* May 2, 1733, *in the Afternoon. By Mr.* G. Graham, *F. R. S. in* Fleet-street, London.

V. *A Letter from Mr.* Stephen Gray, *F. R. S. to the* Publisher, *containing an Account of the same* Eclipse *of the* Sun, *as observed by himself at* Norton-*Court: and at* Otterden-*Place, By* Granvill Wheler *Esq; F. R. S. both in* Kent.

VI. *An Observation of the same* Eclipse *of the* Sun, *by Mr.* J. Milner, *at* Yeovil *in* Somersetshire, *communicated in a Letter to Dr.* John Allen, *M. D. F. R. S.*

VII. *Nonnullæ* JOVIS *Satellitum Eclipses* Bononiæ, *Observatæ ab* Eustachio Manfredi.

VIII. *A*

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X. *Obſervations of the* Variations of the Needle *and* Weather, *made in a Voyage to* Hudſon's-Bay, *in the Year* 1731, *by Capt.* Chriſtopher Middleton, *communicated to the* Royal Society *by Mr.* Benj. Robins, *F. R. S. with a Letter to Mr.* Robins.

XI. *Obſervatio Eclipſis Solis totalis cum mora facta* Gothoburgi Sveciæ, *ſub elev. Poli* 57° 40′ 54″, *d.* 2 Maij, *ſtylo Jul. Anni* 1733, *à Dom.* Birgero Vaſſenio, *Lectore Mathem. in* Gymnaſio *Regio* Gothoburg.

XII. *Propoſals for the Improvement of the Hiſt. of* Ruſſia, *by publiſhing, from time to time, ſeparate Pieces to ſerve for a Collection of all ſorts of* Memoirs *relating to the Tranſactions and State of that Nation: By* Ger. Fred. Muller, *Prof. Hiſt. Petropol. and F. R. S. Tranſlated from the* German *by Mr.* Zolman.

XIII. *An Account of an Experiment contrived by* G. J. s'Graveſande, *F. R. S. Prof. Math. at* Leyden, *relating to the Force of moving Bodies, ſhewn to the* Royal Society, *by* J. T. Deſaguliers. *LL. D.* and *F. R. S.*

Jos: Banks

I. *An Account of Symptoms ariſing from eating the Seeds of* Henbane, *with their* Cure, *&c. and ſome occaſional Remarks, by Sir* Hans Sloane, *Bart. P. S. R.*

IN the Year 1729, a Perſon came to conſult me on an Accident, that befell four of his Children, aged from four Years and a half, to thirteen Years and a half, upon eating ſome Seeds they had gathered in the Fields, near *Pancras*-Church, which they miſtook for Philberts. He brought one of the *Capſules* with him: I inſtantly knew it to be that of the *Hyoſciamus niger, vel vulgaris*, C. B. (or the common Henbane) which bears ſome groſs Reſemblance to the Husk of a Philbert; and the Seeds are like thoſe of the Poppy. The Symptoms that appear'd in all the Four were, great Thirſt, Swimmings of the Head, Dimneſs of Sight, Ravings, and profound Sleep; which laſt, in one of them, continued two Days and Nights.

I order'd them all to be bled, bliſter'd in ſeveral Places, and afterwards purged with a Medicine compoſed of *Elect. lenitiv. Ol. amygd. dulc. flor. Sulph. & Syr. flor. perſicor.* which operated both by Vomit and Stool: And by this Method they perfectly recovered

The *Delirium* occaſioned by theſe Seeds differs from the common, and in ſome Meaſure agrees with that produced by the *Dutroa*, a Species of *Stramonium*; and by the *Bangue* of *Eaſt-India*, a ſort of Hemp:

And they are all different from that kind of Diſorder cauſed by the rubbing with a certain Ointment made uſe of by Witches (according to *Lacuna*, in his Verſion and Comments upon *Dioſcorides*) the Effect of which (as he was told) is to throw the Perſons into deep Sleep, and make them dream ſo ſtrongly of being carried in the Air to diſtant Places, and there meeting with others of their diabolical Fraternity; that when they awake they actually believe, and have confeſs'd, that they have performed ſuch extravagant Actions.

On this Occaſion, I beg leave to give an Inſtance of the great Virtues of Henbane-Seeds in the Tooth-ach. Some Years ago, a Perſon of Quality tormented with this racking Pain, had an Empyrick recommended to him; his Anguiſh obliging him to ſubmit to any Method of procuring Eaſe: The Quack convey'd the Smoke of burning Henbane-Seeds, by means of a Funnel, into the hollow Tooth, and thereby removed the Pain: But at the ſame time there dropped ſome Maggots from the Tooth (as he pretended) into a Pail of Water placed underneath for that purpoſe; which was very ſurprizing to the Beholders. Being told the Story, I procured one of the Maggots, and ſent it wrapt up in Silk to Mr. *Leeuwenhoek*, at *Delft* in *Holland*, where it arrived ſafe and alive. Upon Examination, he found it to be entirely like thoſe bred in ordinary rotten Cheeſe: Wherefore, he got ſome of theſe latter, and carefully fed them, and that I had ſent, on the ſame Cheeſe, and they were all, according to the uſual Methods of Nature turn'd into ſmall *Scarabæi*; ſo that there appeared not the leaſt Difference between them either when Maggots or *Scarabæi*, both being return'd me from *Holland*.

Upon

Upon the whole, though the Smoke of the Henbane-Seeds cured the Tooth-ach, 'tis highly probable the Maggots had been conveyed thither, and let drop into the Water by ſome ſlight of Hand; ſeeing, by means of ſome ſuch unjuſt Dexterity, Empyrics daily acquire Reputation from a Medicine, which from the Preſcription of an honeſt Phyſician would be taken little Notice of.

II. *An Abſtract of the* Meteorological Diaries, *communicated to the* Royal Society, *with Remarks upon them. By* Wm. Derham, *D. D. Canon of* Windſor, *and F. R. S.* [PART I. *Vide* Tranſact. No. 423:]

PART II. Containing Meteorological Obſervations made at

Petersburgh, *Lunden* in *Sweden*, } 1724, 1725. | *Lunden* in *Sweden*, } 1724.

A Journal of Meteorological Obſervations *made at* Petersburgh, *By the Rev. Mr.* Tho. Conſett, *from* Nov. 24, 1724, *to* June 23, 1725, *abſtracted for the Uſe of the* Royal Society. *By* Wm. Derham, *F. R. S.*

THIS Journal contains Obſervations, three times in the Day, of the Barometer, the Winds and their Strength, the Weather, and (after *April* 15) of the Thermometer. Which Obſervations (although very curious and uſeful) yet being too long, would be

tedious to be read at the Societies Meetings; I therefore desire the following Extract may be acceptable.

Mr. *Consett*, from the beginning noteth down the Barometrical Variations, but I know not his Divisions, and Degrees, 'till *Decemb.* 18, at 3h. p. m. and then the Barometer was at 30.66 Wind N E1. and Fair.

From *Novemb.* 24 to the End of the Month, the Weather was Cloudy, with Snow, and a deep Snow on the last Day, and Fair on the 28th. The Winds were Easterly and N E. of 2 and 3 Degrees Strength, 'till the 29th and 30th, and then S E3. S4. and S W3.

In *Decemb.* it was Cloudy, with some Snow, 'till *Dec.* 8, and 9, which were fair Days. Then Cloudy on the 10th and 11th, and Rain in the Evening. Afterwards some cloudy and moist Air; some Fair, 'till *Dec.* 23, and then Hail; Wind S W3. The next Day Snow; and the rest of the Month some Cloudy and Dark, with Snow, and some Fair. The Barometer, ever since the 18th, hath been above 30 Inches, and on *Dec.* 26, it was 30.84; on *Dec.* 30, 30.96, and 31.00; and lastly on *Dec.* 31, it was 31.12,

In *Jan.* 172$\frac{4}{5}$, on the 3d Day, the Barometer was at 30.65, on the 4th before Noon 31.32, after Noon 31.36, but on the 5th it was in the Afternoon 31.59, the Wind S W1. and cloudy Weather, which is the highest Range of the Quick-silver in all the Observations, and if I mistake not, the highest I ever met with any where, and at any time. On the other Hand, the lowest Range was on *February* 25, at 28.28; Wind W4. and Snow. The Barometer was above 30 Inches all the Beginning of *Jan.* 'till the 18th, and then it gradually fell to 28.36. The Winds,

Winds, for the moſt part, were in ſome Weſterly Point 'till *Jan.* 11, and then S E^{e}. with Fair, and an hard Froſt for a Week; the Weather, before the 11th, being Cloudy and Moiſt, with ſome Snow now and then, and a little Rain on *Jan.* 1. All the reſt of *Jan.* was, for the moſt part, Cloudy with Snow, and but little Fair, and that attended with Froſt.

In *Feb.* the Barometer continued high, until, by a gradual Deſcent, it came to 28.98, on *Feb.* 15, and 17; Wind Weſterly 3. and 4. But on *February* 25, it fell to 28.28; Wind W^{t}, and is abovementioned. The greateſt Part of this Month the Weather was cloudy, and ſometimes with thick Darkneſs, frequent Snow, and now and then Fair, with ſharp Froſt.

All *March* the Barometer was above 29 Inches, ſometimes above 30. The greateſt Part of the Month was Cloudy, with frequent Snow, and ſome Fair, with ſharp Froſts; the Winds were variable, and their Strength about 1 and 2 Degrees all the Month, and ſeldom at 3 Degrees, nor Calm at any time.

All *April* the Barometer was above 29 Inches, and under 30. In the Beginning of the Month Snow and Cloudy, with ſome Fair, and ſharp Froſts, 'till *Apr.* 13, when Mr. *Conſett* ſaith, the continual Winter-Froſts were thawed; and that on the 15th they left off their Fires in their Stoves. After this, ſome Cloudy, ſome Rain, and ſome Fair; the Winds were variable, commonly 1 and 2 Strength, now and then 3, and not any Day 0.

From *Apr.* 16, he obſerved the Thermometer; which being one made by Mr. *Haukesbee* ſtood at 51, which is between cold Air, and Temperate; the freezing Point being at 65; it then roſe for ſome Days to 46, and 40, 'till on the 22d it was at 36, and towards the End of the Month it fell again to 47. All

All *May* the Range of the Barometer was between 28 and 29 Inches; and for the moſt part above 29.50. The Thermometer was on the 1ſt Day at 52.8, and continued riſing to 50 on the 7th, where it ſtood to about the 14th, and then aroſe to 40 for the following Days, being at 40.25 on the 17th in the Morning, Wind S^{e}. and fair, when in the Evening of the ſame Day it aroſe to to 30.34, Wind W^{e}. with Rain; it ſoon got down again to 40 for ſeveral Days; but from the 27th to the End it was about 30.50. This Month had much more Fair than any of the preceding Months, together with ſome Cloudy with Showers, and ſome heavier Rain.

In *June* the Range of the Barometer was (as in the laſt Month) between 28 and 29 Inches, but more frequently under 29.50 than it was in that Month. The Thermometer was all this Month between 40 and and 41, only on the 1ſt, 2d, 3d, 8th, 11th, 13th, 23d Days, it was a little above 31, but never ſo high as 30, which is between warm Air, and Hot. On *June* 2, Rain fell with Hail. And (as I have obſerved in ſome of theſe Papers) that *Cold in Summer produces Rain*, ſo much Rain fell on *June* 5; after which, ſome Cloudy, with frequent Showers, and many Days fair, to *June* 23, on which the Obſervations end.

Thus I have given an Abſtract of the *Meteorological Obſervations* at *Petersburgh*, and have taken what Care I could to note ſuch Matters as may give the Society a juſt Notion of the State of every Month at that Place, and that which was moſt obſervable in it. I could wiſh, that either the Society, or I myſelf could have had ſome Obſervations in the more Southerly Parts, to have tallied with theſe.

APPEN-

APPENDIX

To the foregoing Obſervations, being Meteorological Obſervations *at* Lunden *in* Sweden, *in the Year* 1724, *which tally with Mr.* Conſett's.

Theſe Obſervations not coming to Hand 'till I had finiſhed thoſe at *Petersburgh*, I am forced to ſubjoin them by way of Appendix; and the 1ſt Obſervation I ſhall make, ſhall be of the Range of the *Mecrury* in the *Barometer*, which ſeems to be different in both Places, as far as I can judge of the Matter, by the few Obſervations that tally with one another, which is only from *December* 18, to the End of that Month, Mr. *Conſett*'s Barometrical Diviſions before that time not being intelligible: And in all that Fortnight's time, the *Petersburgh* Barometer was above 30 Inches, and once above 31; whereas that at *Lunden* was but a little above 29, and but once at 29.6: And indeed, through the whole Year, the *Lunden* Barometer, I obſerve, was only now and then below 29 Inches, and much ſeldomer above 30. But I ſhall perhaps be better able to give an Account of theſe Matters when I come to the Obſervations of future Years.

2. As I have taken Notice in other Places, ſo I find in theſe Obſervations a great Conformity between the Winds, eſpecially when ſtrong for ſome time, and when they have been for ſome time in or near the ſame Quarter.

3. As for the *Weather*, no good Judgment could be made of it in the Space of five Weeks, which is all the time in which the Obſervations tally: Only I take Notice that Thunder was more frequent at *Lunden* than *Petersburgh* during that time.

An

An Abſtract of the Meteorological Obſervations *of the whole Year* 1724, *made at* Lunden *in* Sweden. *By* ——: *Abridged for the Uſe of the* Royal Society. *By* Wm. Derham, *F. R. S.*

Having taken Notice of the Obſervations in 1724, that tally, I proceed to the whole Year's Obſervations of *Lunden*.

I begin with the *Barometrical Ranges*, which will be beſt ſeen and compared by theſe two little Tables; the firſt of which is, in part, the curious Author's, *viz.* the mean Heights of the *Mercury*; to which I have added the higheſt and loweſt Ranges in each Month. And becauſe it will take up but little Room, I have added the Author's Mean of his Thermometrical Obſervations, although, I confeſs, I ſcarce underſtand the Diviſions of his Thermometer.

The Higheſt and Loweſt Ranges of the Barometer, and the Mean of the Barometer and Thermometer at *Lunden*, in the Year 1724.

	Jan.	*Feb.*	*Mar.*	*Apr.*	*May*	*June*
High	29. 8	29. 9	30. ½	30. ½	29. 9	29. 9
Mean	29. 3	29. 2	29. 4	29. 6	29.4 ½	29. 4
Low	28. 8	28. 6	28. 8	29.1 ½	29. 0	28. 9
Therm.	24.i	37.i	21.i	6 ½	13.s	45.s

	July	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*
High	29. 7	29. 9	29. 9	30. ½	30. ½	30.1 ½
Mean	29.2 ½	29.5 ½	29. 3	29. 5	29. 5	29.2 ½
Low	28. 8	29.2 ½	28. 7	29. ½	28. 9	28. 3
Therm.	34.s	23.s	1 ½	15. i	30.i	43.i.

The

The Barometrical Heights at *Petersburgh*, A. D. 1724 and 1725.							
	Dec.	*Jan.*	*Feb.*	*Mar.*	*Apr.*	*May*	*June*
High	31.12	31.59	30.36	30.35	29.87	29.99	29.81
Mean	30.61	29.97	29.32	29.76	29.57	29.67	29.45
Low	30.11	28.36	28.28	29.18	29.28	29.35	29.10
The Heights of the Thermometer.							
High	——	——	——	——	36.0	30.34	30.70
Mean	——	——	——	——	45.0	40.98	40.0
Low	——	——	——	——	54.7	52.8	40.63

By comparing theſe two Tables together, it is manifeſt that the *Mercurial Aſcents* are much greater at *Petersburgh* than at *Lunden*, and that the *Deſcents* are nearly the ſame; ſo that the Range of the Barometer at *Petersburgh* is 3 Inches, 31 hundredth parts; but at *Lunden* only 1 Inch, and about 8 Tenths. And the greateſt Height of the Thermometer at *Petersburgh*, was on *May* 17, 30.34.

Of the Winds and Weather at Lunden, *in* 1724.

In *Jan.* the Winds were, for the moſt part, about the Weſterly and Southerly Points, and frequently very boiſterous. The Weather was ſome Cloudy, ſome Fair, frequent Rain, but no Cold taken notice of 'till *Jan.* 30.

In *Feb.* the Winds frequented the ſame Points as in *Jan.* but they lay more between the N. and E. than then; and they were very boiſterous oftentimes. In this Month Snow was frequent, and now and then Thunder, and but little Fair Weather.

In *March* the Winds were very variable, and ſometimes ſtrong. The Weather more ſerene than before,

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In *March* the Winds were very variable, and ſometimes ſtrong. The Weather more ſerene than before,

with ſometimes Snow, and towards the latter End Rain, and now and then a Froſt.

In *April* the Winds were more Northerly and Eaſterly than in *March*, and not very ſtrong. The greateſt Part of the Month was Freezing, and Fair, with ſome Days of Rain with Thunder.

The Beginning of *May* to the 16th the Mornings were Froſty, with ſome Rain, ſome Snow, and ſome Fair the reſt of the Day; after the 16th ſome Rain and ſome Snow; and towards the End of the Month Fairer. The Winds were variable, briſk, and about the 23d, 24th, and 25th, ſtormy.

In *June* the Winds variable, pretty briſk, and ſtormy on the 10th, 11th, and 12th; then the Weather for the moſt part Fair 'till the 15th; after that Cloudy, and but little Fair, with frequent and plentiful Rain.

July alſo was a Cloudy, Wet Month, with but little Fair, and ſome Thunder, which was ſometimes violent. The Winds, for the moſt part, were between the W. and S. and moderate.

In *Auguſt* the Winds were more Northerly and Eaſterly than in *July*, and ſometimes between the Weſt and South, and moderate in all the Points. The firſt 9 or 10 Days were, for the moſt part, Fair; after that, 9 or 10 Days, more Cloudy, Rain, Lightening in the Evening, loud Thunder and Rain in the Day, and ſome in the Night; and from the 20th to the Month's End Fairer, with Cloudy, Hail, and Rain.

In *Sept.* the Winds frequented the Northerly and Weſterly Points, were Briſk, and ſometimes Stormy; the Mornings, for the moſt part, Cloudy the 9 firſt Days, and Fairer the reſt of the Day. The greateſt part of the reſt of the Month was Rainy, with plenty of

Snow

Snow on the 25th; then Rain, which continued in the Month of

October during the 9 firſt Days; the reſt of the Month was Cloudy, with now and then Hoar-Froſts, and ſome Fair. The Winds varied often, but were the moſt frequent in ſome of the Southerly and Weſterly Points, and not very high.

In *November* the Winds were ſometimes in the Weſterly and Southerly Points, but more frequent in the Northerly and Eaſterly, for the moſt part of a moderate Strength. The 9 firſt Days the Weather was Cloudy, then Snow and Froſt to the 17th; then to the End Cloudy, Snow, Hoar-Froſt, Rain, and but little Fair, and that in the Morning.

In *December* the Winds were moderate, and often in the Southerly and S W. Points, ſeldom Northerly. The 5 firſt Days were Cloudy and Wet; then Snow and Froſt the 6th, 7th, and 8th; then Cloudy to the 13th; then Hoar-Froſt, and Fair on the 14th, 15th, and 16th; then Cloudy, with Thunder, Rain, Snow, and Froſt, at diverſe times, in the reſt of the Month.

III. *An Account of the* damp Air *in a* Coal-Pit *of Sir* James Lowther, *Bart. ſunk within* 20 *Yards of the Sea; communicated by him to the* Royal Society.

SIR *James Lowther* having Occaſion to ſink a Pit very near the full Sea-Mark, for the draining one of his principal Collieries near *Whitehaven*, in the County of *Cumberland*, which was known would

be near 80 Fathom in Depth to the beſt Seam of Coals, which is three Yards thick; the Work was carried on Day and Night very ſucceſsfully, through ſeveral Beds of hard Stone, Coal, and other Minerals, 'till the Pit was ſunk down 42 Fathom from the Surface, where they came to a Bed of Black Stone, about ſix Inches think, very full of Joints, or open Cliffs, which divided the Stones into Pieces of about ſix Inches Square, the Sides whereof were all ſpangled with Sulphur, and in Colour like Gold. Under this Black-Stone lies a Bed of Coal two Foot thick: When the Workmen firſt prick'd the Black-Stone Bed, which was on the riſe Side of the Pit, it afforded very little Water, contrary to what was expected; but inſtead thereof a vaſt Quantity of damp corrupted Air, which bubbled through a Quantity of Water, then ſpread over that part of the Pit, and made a great hiſſing Noiſe; at which the Workmen being ſomewhat ſurpriz'd, held a Candle towards it, and it immediately took Fire upon the Surface of the Water, and burn'd very fiercely; the Flame being about half a Yard in Diameter, and near two Yards high, which frightned the Workmen ſo that they took the Rope, and went up the Pit, having firſt extinguiſhed the Flame, by beating it out with their Hats; the Steward of the Works being made acquainted with it, went down the Pit with one of the Men, and holding a Candle to the ſame Place, it immediately took Fire again, as before, and burnt about the ſame Bigneſs; the Flame being blue at the Bottom, and more white towards the Top. They ſuffer'd it to burn near half an Hour, and no Water being drawn in that time, it roſe and cover'd the Bottom of the Pit near a Yard deep,

but

but that did very little abate the Violence or Bulk of the Flame, it ſtill continuing to burn upon the Surface of the Water. They then extinguiſhed the Flame as before, and opened the Black-Stone Bed near two Foot broad, that a greater Quantity of Air might iſſue forth, and then fired it again; it burn'd a full Yard in Diameter, and about three Yards high, which ſoon heated the Pit to ſo great a Degree, that the Men were in Danger of being ſtifled, and ſo were as expeditious as poſſible in extinguiſhing the Flame, which was then too ſtrong to be beaten out with their Hats; but with the Aſſiſtance of a Spout of Water, of four Inches Diameter, let down from a Ciſtern above, they happily got it extinguiſhed without further Harm. After this no Candles were ſuffered to come near it, 'till the Pit was ſunk down quite through the Bed of BlackStone, and the two Foot Coal underneath it, and all that part of the Pit, for four or five Foot high, was fram'd quite round, and very cloſe jointed, ſo as to repel the damp Air, which nevertheleſs, it was apprehended, would break out in ſome other adjoining part, unleſs it was carried quite off as ſoon as produced out of the Cliffs of the Stone; for which End a ſmall Hollow was left behind the Framing, in order to collect all the damp-Air into one Side of the Pit, where a Tube, of about two Inches Square, was cloſely fixed, one End of it into the Hollow behind the Framing, and the other carried up into the open Air, four Yards above the Top of the Pit; and through this Tube the ſaid damp Air has ever ſince diſcharged itſelf, without being ſenſibly diminiſhed in its Strength, or leſſened in its Quantity, ſince it was firſt opened, which is now two Years, and nine Months ago: It is

juſt

juſt the ſame in Summer as in Winter, and will fill a large Bladder in a few Seconds, by placing a Funnel at the Top of the Tube, with the ſmall End of it put into the Neck of the Bladder, and kept cloſe with one's Hand.

The ſaid Air being put into a Bladder, as is above deſcribed, and tied cloſe, may be carried away, and kept ſome Days, and being afterwards preſſed gently thro' a ſmall Pipe into the Flame of a Candle, will take Fire, and burn at the End of the Pipe as long as the Bladder is gently preſſed to feed the Flame, and when taken from the Candle, after it is ſo lighted, it will continue burning 'till there is no more Air left in the Bladder to ſupply the Flame. This ſucceeded in *May* laſt before the *Royal Society*, after the Air had been confined in the Bladder for near a Month.

The Air, when it comes out at the Top of the Tube, is as cold as Froſty Air.

It is to be obſerved that this ſort of Vapour, or damp Air, will not take Fire except by Flame; Sparks do not affect it, and for that Reaſon it is frequent to uſe Flint and Steel in Places affected with this ſort of Damp, which will give a glimmering Light; that is a great Help to the Workmen in difficult Caſes.

After the damp Air was carried up in a Tube, in the Manner above deſcrib'd, the Pit was no more annoy'd with it, but was ſunk down very ſucceſsfully through the ſeveral Beds of Stone and Coal, without any other Accident, or Interruption, 'till it came to the main Seam of Coals, which is three Yards thick, and 79 Fathom deep from the Surface; and the ſaid Pit being Oval, *viz.* ten Foot one way, and eight the other,

it ſerves both for draining the Water by a Fire-Engine, and alſo for raiſing the Coals.

Whitehaven, Aug. 1, 1733.

IV. *An Obſervation of the* Eclipſe *of the* Sun *on* May 2, 1733, *in the Afternoon. By Mr.* George Graham, *F. R. S. in* Fleet-ſtreet, London. *Made with a* Teleſcope *of ten Feet in Length, fitted with a* Micrometer.

App. Time.	
At 5^h $44'$ $45''$	It began.
6 25 30	The Cuſps were vertical.
6 37 30	The Eclipſe was greateſt, the lucid Part of the Sun's Diameter meaſuring 426 Parts, whereof the Sun's Diameter meaſured 2311. So that the Eclipſe was $9\frac{4}{5}$ Digits.
6 46 00	The Cuſps were horizontal.
7 28 23	The Eclipſe ended.

V. *A Letter from Mr.* Stephen Gray, *F. R. S. to the* Publiſher, *containing an Account of the ſame* Eclipſe *of the* Sun, *as obſerved by himſelf at* Norton-*Court: and at* Otterden-*Place, By* Granville Wheler *Eſq; F. R. S. both in* Kent.

Norton-Court, *May* 19, 1733.

SIR,

HAving obſerved the late Eclipſe of the Sun, at *Norton*-Court, near *Feverſham* in *Kent*, the Seat of my Honoured Friend *John Godfrey*, Eſq; and the Week following being with my Honoured Friend *Granville Wheler*, Eſq; at *Otterden*-Place, he was pleaſed to communicate to me his Obſervations of the ſaid Eclipſe. I preſume, an Account of them may not be altogether unacceptable to the *Royal Society*.

The

The Eclipſe of the Sun on May 2, 1733, *obſerved at* Norton-*Court*, *near* Feverſham *in* Kent.

		Appar. Time h	m	s.	
Obſervat.	1	5.	49.	15	Beginning
	2	5.	53.	15	1 Digit
	3	5.	57.	30	2 Digits
	4	6.	2.	55	3 ¾
	5	6.	11.	50	5
	6	6.	16.	43	6
	7	6.	21.	7	7
	8	6.	27.	0	8
	9	6.	32.	45	9
	10	6.	37.	30	9 ½
	11	6.	40.	0	9 ⅞ Greateſt
	12	6.	56.	56	8
	13	7.	0.	35	7 ⅝
	14	7.	7.	0	6
	15	7.	11.	55	5
	16	7.	17.	0	4
	17	7.	21.	15	3
	18	7.	25.	55	2
	19	7.	32.	30	End

Our Obſervations were made with an Helioſcope, or Inſtrument conſiſting of a Teleſcope and Box with a Digit Scheme at the End of it. The Teleſcope was 6 Feet, the Box two Feet in length, and the Sun's Image on the Scheme was 6 Inches and 8 Tenths in Diameter. The Clock was rectified on the Day of the Eclipſe, and proved to need no Correction for ſeveral Days afterwards, by Obſervations of the Sun on the Meridian. The Sun's Tranſit was taken by the Paſſage of its Rays through a Hole made in a Braſs Plate, the Center of which Hole was at 6 Feet and

3 Inches perpendicular Height, above the horizontal Plane on which the Meridian Line was drawn.

Mr. *Wheler*, at *Otterden*-Place, near *Lenham* in *Kent*, obſerved the Beginning at $5^h\ 49'\ 0''$, and the End at $7^h\ 31'\ 49''$. His Obſervations were made with a Teleſcope of 15 Feet in length, and his Time was alſo rectified by a Meridian Line; but it was done by a Tranſit of the Rays through an Hole at a much greater Height. For the Braſs Plate in which the Hole was made was fix'd to a Window in the Roof of his Hall, at the Height of 27 Feet above the Meridian Line on the Floor.

With my humble Duty to the *Royal Society*, I remain,

Sir,
Your humble Servant,
Stephen Gray.

VI. *An Obſervation of the ſame* Eclipſe *of the* Sun, *by Mr.* J. Milner, *at* Yeovil *in* Somerſetſhire, *communicated in a Letter to Dr.* John Allen, *M. D. F. R. S.*

SIR,

I Beg leave to preſent you with the Obſervations I made on the Eclipſe *May* 2, *viz.*

The Beginning	at	$5.^h$	$34.^m$	00^s	$17.^\circ\ 45'$ } Sun's Alt.
	at	6.	00.	00	13. 36 }
	End at	7.	14.	30	2. 45 }

I made Uſe of a Quadrant 2 Feet *radius*.

J. Milner.

Lat. *Yeovil*, 51°. *May* 4, 1733.

VII. *Nonnullæ* JOVIS *Satellitum Eclipſes* Bononiæ, *Obſervatæ ab* Euſtachio Manfredi.

Anno 1732. *Apr.* 2.

Temp. Ver. h	′	″	
10	56	3	Emerſio 2di ſatellit. *Jovis* ab umbra, cœlo ſereno, Teleſcopio pedum 22.
13	2	36	Emerſio 4ti ſatel. *Jovis* ab umbra, cœlo ſereno, Teleſ. p. 22.
			Apr. 3.
7	31	40	Emerſio ab umbra intimi *Jovis* ſatel. cœlo ſereno, Teleſ. p. 22.
			Apr. 9.
13	32	4	Emerſio ab umbra 2di ſatel. *Jovis*, cœlo ſereno, Teleſ. p. 22. aliquantulum dubia.
			Maij 3.
9	44	41	Emerſio ab umbra intimi ſatel. *Jovis*, cœlo ſereno, Teleſ. p. 22.
			Maij 4.
			Emerſio ab umbra *Jovis* 2di ſatel. nebuloſo cœlo, & ſpirante vento.
10	35	32	Teleſ. p. 14.
10	35	41	Teleſ. p. 11.
			Maij 26.
			Emerſio intimi ſatel. *Jovis* ab umbra, cœlo ſereno.
9	58	4	Teleſ. p. 22.
9	58	21	Teleſ. p. 11.

Temp. Ver. h	'	"	
			Anno 1732. *Jun.* 2.
9	43	47	Emerſio 3^tii ſatel. ab umbra *Jovis*, nebuloſo cœlo, Teleſ. pedum 22.
			Jun. 9.
11	7	24	Immerſio 3^tii ſatel. in umbram cœlo ſereno, Teleſ. p. 22.
			Jun. 18.
10	8	25	Emerſio ab umbar intimi *Jovis* ſatel. cœlo ſereno, Teleſ. p. 22.
			Julij 27.
7	36	5	Emerſio intimi ſatel. ab umbra *Jovis*, cœlo ſereno, Teleſ. p. 11. dubia.
			Anno 1733. *Jan.* 17.
			Immerſio 3^tii ſatel. in umbram *Jovis*, cœlo ſereno.
14	8	45	Teleſ. p. 22.
14	8	33	Teleſ. p. 14.
16	13	29	Emerſio 3^tii ſatel. ab umbra *Jovis*, cœlo ſereno, Teleſ. p. 22.
			Mart. 12.
			Immerſio intimi ſatel. in umbram *Jovis*, cœlo ſereno.
13	23	34	Teleſ. p. 22.
13	23	22	Teleſ. p. 11.

VIII. *A Letter from Mr.* Richard Lewis, *at* Annapolis *in* Maryland, *to Mr.* Collinſon, *F. R. S. containing the Account of a remarkable* Generation *of* Inſects; *of an* Earthquake; *and of an* Exploſion *in the Air.*

Annapolis Oct. 27, 1732, in *Maryland.*

SIR,

I Send you herewith ſome Leaves of a Fly-Tree (ſo it is call'd by ſome People) from whence vaſt Swarms of Flies have been obſerved to iſſue; having heard ſtrange Stories about it, I deſired a Perſon who went to ſee it, to bring me ſome of the fly-bearing Leaves; about the latter End of *June* laſt he brought me ſome Leaves, on which was fix'd a tough little Bag, as big as the Huſk of a Philbert, but is now very much ſhrunk with drying. It was of a duſky green Colour; I cut it open, and a Fly, like a Gnat, came out of it; I diſcover'd no more Flies, 'till looking at it with a Glaſs, I could diſcern ſomething moving amongſt the bluiſh Pulp, and after a while obſerv'd that it contain'd many red Grubs, very ſmall, without Wings; I bound up the *Nidus*, and next Morning the Grubs had gotten bluiſh Wings, and their Body was of a grayiſh Colour; there was a great Number of them, but they ſoon flew away. I went to ſee the Tree; its Bark and Leaf reſembles a Male Mulberry, the Leaves were plentifully ſtock'd with theſe Bags; I open'd ſeveral of them which were plentifully ſtock'd with theſe Inſects. Amongſt all the Excreſences

which

which I have ſeen on Leaves, I have obſerved none like theſe. When the Leaf is ſmall they are ſcarcely diſcernable, they grow with the Leaf, which is not diſcolour'd or crumpled by them. I have read *Rhedis*'s curious Treatiſe of the Generation of Inſects, but found no Account therein of any of their Neſts like theſe.

On *Tueſday* the 5th of *September* laſt, about Eleven in the Morning, an Earthquake was felt in diverſe Places in *Maryland*; the moſt particular Account I have heard of it was from Mr. *Chew*. It ſhook his Houſe for ſome time, and ſtopp'd the Pendulum of his Clock; during its Continuance, a rumbling Noiſe was heard in the Air, and many People who did not feel the Shaking, as well as thoſe who did, complained of a Dizzineſs in their Heads, and Sickneſs at their Stomachs: At the ſame time, I have been credibly informed, it was felt in *Penſilvania*, and *New-England*; but I have not heard whether it extended to North or South *Carolina*.

Having mentioned the Earthquake above, I ſhall mention a ſurprizing Phænomenon that happen'd in 1725, ſomething of the ſame Nature, but with ſome remarkable Difference, as it was lately ſent me by Capt. *Richard Smith*.

Octob. 22, 1725, about Two in the Afternoon, the Sky being very ſerene and clear, Capt. *Smith* heard, as he then thought, the Noiſe of a Gun, of a Minion Size, about 12 Miles Eaſtward from him, which Noiſe was repeated at leaſt 20 times, but at unequal Diſtances of time, and ſoon afterwards followed a very loud Exploſion, as if a Ship had been blown up: Upon Enquiry, he was told by ſeveral Perſons who lived about

12 Miles

12 Miles diſtant from his Houſe, that they were greatly amazed with the Appearance of an extraordinary Brightneſs in the *Zenith*, reſembling Flame, which continued for about 5 Minutes, and then the imaginary Guns were fired twenty or thirty times, which ſo diſturb'd the Atmoſphere, that the Birds loſt the Uſe of their Wings, and fell to the Ground in great Diſorder. This Noiſe was heard about fifty Miles each Way, from the bright Appearance aforeſaid. — *Thus far the Captain.*

I heard the Noiſe (as moſt People did) but ſaw not the Brightneſs at *Patapsko*, being about 60 Miles from the Captain's Houſe. I was told that the Shock, occaſioned by the Noiſe, threw down Pewter that was ſet to dry againſt the Side of a Houſe. As this in ſome manner reſembled an Earthquake (which has ſcarce ever before diſturb'd our Northern World) I ſhould be glad to know your Opinion of ſuch Exploſions. From your humble Servant,

Richard Lewis.

IX. *A Letter from Mr.* Evan Davis *to Mr.* John Eames, *F. R. S. concerning ſome* Children inoculated with the Small-Pox, *at* Haverford-Weſt *in* Pembrokeſhire.

SIR,

HAD I known in the Beginning of laſt Spring that an Account of the Succeſs of Inoculation in the Small-Pox, practis'd here about that time, would be agreeable to you, as you ſignify in your laſt, I would

would not have delayed ſo long to communicate it. If the Account had then been taken with a View of ſending it abroad, it would probably have been more full and particular in ſome Circumſtances relating to the ſeveral Stages and Appearances of that Diſtemper in the Caſes of thoſe who were inoculated with it, than could now be recollected at this Diſtance of time; yet I hope nothing material has been omitted, that may be neceſſary for forming a Judgment on thoſe Caſes which you have here related. The Meaſles interfering with the inoculated Small-Pox, and prolonging the time between the Inoculation and the Eruption of this latter ſo much beyond what otherwiſe was uſual, as you will obſerve below it did in every one of the Inſtances mentioned, had, I thought, ſomething in it that was peculiar and uncommon, and therefore what might deſerve your Notice. This was the ſecond Opportunity that has been taken to practiſe this Method of Inoculation in this Town and Neighbourhood. It was firſt introduced here about ten Years ago, by the ingenious and learned Dr. *Perrott Williams*, who then lived in this Town, and had practis'd Phyſick for ſeveral Years in this Country with eminent Succeſs; but is ſince removed to *London*. He had then his own Children inoculated among ſome of the firſt on whom the Experiment was made, and (if I forget not) ſent an Account of that Matter about that time to your Society, which was afterwards publiſhed by Dr. *Jurin*.

Our Inoculators are two Surgeons of good Note and repute in this Town (who alſo keep Apothecaries Shops) and are the only Perſons that I hear of in theſe Parts who are come into that Practice. Upon my requeſting

queſting it, I received from them this laſt Week the Account following.

Some little time before laſt Chriſtmaſs the Small-Pox appear'd in this Town, chiefly of the confluent kind: Some had it with Purple-Spots, and other violent Symptoms, whereof ſeveral died. Towards the Spring, the Meaſles became more Epidemical, and alſo more fatal, than the Small-Pox. Some of the Subjects that had been viſited but a little time before with the Small-Pox, and upon their Recovery had their Bodies purged, yet died of the violent Cough which attended and ſucceeded the Meaſles, which afterwards ſeized them. The Meaſles continued to rage 'till almoſt all the Subjects in this Place were viſited with them, the Small-Pox continuing alſo during the whole time, yet making but a ſlow Progreſs; and to this time it has not left us.

About the End of *February* laſt, Mr. *Francis Meyler* inoculated his own Son, near three Years old, from a Child of about the ſame Age, who had the diſtinct Sort of Small-Pox, but the Puſtules ſmall. He made a ſlight Inciſion on both Legs, which took only in one: After four Days a Puſtule appeared on the Part wounded, but did not much inflame it, nor make much Progreſs. On the 7th Day the Child grew feveriſh, and on the 8th, or towards the 9th Day (inſtead of the intended Small-Pox) the Meaſles appear'd all over his Body, attended with a Cough; at which time the feveriſh Diſorder abated, 'till the 11th or 12th Day: Then he grew feveriſh again, and towards the 14th Day the Small-Pox appeared, a ſmall diſtinct Sort, and few in Number. After the Eruption was full, he grew hearty, and ſo continued, not being

visited with a second Fever. After this Mr. *Meyler* inoculated two other Children from his own Son, by applying the Matter, after a slight Incision, to both the Legs of each of them, but it did not succeed. About the same time he inoculated two other Children, a little Way out of Town, from a Neighbour's Child, but neither of them were infected. Its not succeeding he knows not what to impute to; whether to the Slightness of the Incision, or to the want of a Sufficiency of Matter to infect with, or to the want of a Disposition in the Subjects to be infected.

About the latter End of *March* last Mr. *Richard Wright* inoculated a Daughter of *Tho. Kymer*, Esq; of this Town, between 3 and 4 Years of Age, from another Child of about the same Age, who had a distinct kind. The Matter was applied to one of her Arms, the Incision being made pretty deep. The Inflammation thereof began about the 4th or 5th Day, and afterwards appeared considerably great. She proceeded until the 7th Day in a very hearty and brisk State, at which time she began to grow heavy, sick, and very feverish. Then an Eruption of the Small-Pox was expected; but her Fever increased, and the next Day there were Eruptions seen all over her Body, which proved to be the regular Measles. She was treated accordingly, and grew well, excepting a pretty severe Cough she had, and this Cough continued through the whole Course of the following Small-Pox. About the 12th Day she sicken'd again, and about the 14th the Small-Pox appeared, the distinct sort, and very favourable; they came out, fill'd, and dry'd away very kindly, and were attended with very little of a second Fever. She went through the Di-

stemper

ſtemper with a great deal of Chearfulneſs: She was purged afterwards, and ſeemed very well; but in a little time after, a Boil came on the lower Part of the Shoulder-Blade of the ſame Arm wherein ſhe was inoculated, which was brought to ſuppurate, and was healed in a common Manner.

From this Subject laſt mentioned Mr. *Wright* inoculated two Daughters and a Son of *Nicholas Roch*, Eſq; at his Seat, about five Miles diſtant from this Town. Theſe three Children were aged from 3 to 8 Years. The Inciſion was made in one Arm of each Child; it produced the ſame Effect on every one of them as it did on Miſs *Kymer*; viz. the Meaſles on the 7th or 8th Day, and the Small-Pox of the diſtinct ſort on the 14th Day. They went all three very well through every Stage of the Diſtemper; the ſecondary Fever was but ſlight. One of theſe had them ſomewhat thick, and the other two had a pretty many of the Pox appearing over them likewiſe; but they thoroughly recover'd all of them, and have all ſince continued in a good State of Health.

Thus, Sir, you have this Affair related by the Inoculators above named, in a faithful, and impartial Manner. You may be aſſured, though perhaps not ſo largely as you might expect, for the Reaſon before alledged: But if there ſhould be Occaſion for explaining themſelves in any Particular, they will readily do it when deſired. I know of nothing I have to add before I conclude, unleſs it be my good Wiſhes, that wherever this Practice takes, it may be attended with the ſame Safety and Succeſs that it has hitherto met with here; which ſeems to me to recommend it as an happy Expedient that Providence has kindly directed

to, in order to guard againſt the Injuries and Dangers of one of the moſt dreadful and deſtructive Diſeaſes incident to Mankind. I have juſt Cauſe, I conceive, to incline me to think very favourably of this Method, from what I have myſelf obſerved of its Advantages. In the Beginning of this Year I loſt one Child out of five I had, by the Small-Pox in the natural Way; and I have ſeen what great Sickneſs and Miſery the other four ſuffered, who all of them had the confluent ſort, in Compariſon with what the Inoculated underwent. One Boy of mine particularly, between 7 and 8 Years of Age, had it ſo violently, that his Life firſt, then his Limbs, Senſes, and Intellects were endangered by it; and he is not yet fully recovered from the Effects of it to his former good Health and Strength, though he had it in *Dec.* and *Jan.* laſt, among thoſe who firſt fell into it, when it came this laſt time to this Place.

Aug. 18, 1732.

P. S. Concerning the four Children above mentioned, on whom the Operation did not ſucceed, but remained uninfected after the variolous Matter was applied in the uſual Way to them. They have all of them ſince eſcaped the Meaſles, though moſt other Children about them had 'em, and none of them have yet had the Small-Pox, though it ſtill continues in the Town. There are not many now that are ſick of it, but it is of the bad confluent kind, attended with Purple-Spots, and watery Bladders that are mix'd with the Purples. It is obſerved, that moſt of theſe who have of late been viſited with it, have died thereof. This probably will incline ſome to uſe Inoculation again, and to make that Practice, under Providence, their Refuge.

I am, Sir, Yours,

Oct. 25. 1732. *Evan Davis.*

Obſervations of the Variations of the Needle *and* Weather, *made in a Voya*
to Hudſon's-Bay, *in the Year* 1731, *by Capt.* Chriſtopher Middleto
communicated to the Royal Society *by Mr.* Benjamin Robins, *F. R.*
with a Letter to Mr. Robins.

ths d ys.	Hours.	Barom. Alt.	Therm Alt.	Lat. *p. Davis*, or Ac^{t}.	Lat. *per Elton.*	Obſ.	Long.	Need. Variat.	Obſ.	Winds.	Weather.
1	9									E N E.	
14	12	30	26	59.17			5^{d}.52	17.30		S E.	Fair and Cloſe.
	9									S E b E.	Dit.
											Fair and Cloſe.
15	9	32	25 1/2								
	12	31	25 1/2 1/2		59.24	Obſ.	8^{d}.58	18.		E S E.	Dit.
	9	32	24 1/2 1/2							Dit.	Dit.
16	9	32	24 1/4							E S E.	Dit.
	12	32	24. 3	59.30			11.50	19.		Dit.	Dit.
	9	32	24 1/2							Dit.	Dit.
										S E b S.	Dit.
17	9	31	24								
	12	31	24 1/2	59.35			15.10	20.		Dit.	Dit.—— at 2 ſmall Rain.
	9	31 1/2	24.							S b W.	Dit.
18	9	31	24.							S W.	Cloudy with ſmall Miſt.
	12	30	24	59.29			18.45	21.		S W b S.	Foggy, with ſmall Rain.
	9	29	23							N N W.	Fair and clear, but cloudy.
19	9	31	25							Dit.	Clear, with Clouds.
	12	31	25	58.54	58.52	Obſ.	21.15	21.30		Dit.	Hazy, with ſmall Rain.
	6	30	24.							N b E.	Fair and Clear.
20	9	30	24	Acc.						S E.	Clear, with ſmall Rain.
	12	30	24 1/4	58.47	58.55	Obſ.	24.11	22.		Dit.	Fair and Cloudy.
	9	29	24 1/2 1/2							S E b S.	Foggy, freſh Gales & Rai
21	9	27	24 1/4							S E.	Freſh Gales, with much R
	12	26	24	58.47			29.13	24.		Dit.	Dit.
	9	25	24							Dit.	Little Wind and foggy.
22	9	25	24	Acc.						E S E	Dit.——with ſmall Rain.
	12	24	23 1/2	58.42	58.47	Obſ.	32.54	26.	Obſ.	S E b E.	Foggy.
	9	24	23 1/2 1/2							E S E.	Dit.
23	9	26 1/2	25							N E b E.	Freſh Gales, hazy & miſty
	12	28	25	58.38			36.55	26.		E N E.	Dit.
	9	30	26 1/4							Dit.	Freſh Gales, with Clouds.
24	9	30	26 3/4							E S E.	Fair, with little Winds.
	12	29	25 1/2 1/2	58.37		Obſ.	40.56	27.30		Dit.	Dit.
	9	28	25 1/2							Dit.	Dit.
25	9	28	25 3/4							E b S.	Light Winds & fair Weathe
	12	27	25	58.32		Obſ.	43	30.	Obſ.	Dit.	Fair and Clear.

Jui

Months and Days.	Hours.	Barom. Alt.	Therm Alt.	Lat. p. *Davis*, or Act.	Lat. p. *Elton*.	Obſ.	Long.	Need. Variat.	Obſ.	Winds.	Weather.
June 25	9	28	25 ¾							N N W.	Cloudy.
26	9	32	28							W N W.	Cloſe.
	12	34	29	57.39			43.17	29		W b N.	Hazy.
	9	31	27							S W.	Freſh Gales & hazy
27	9	33	28							N W.	Foggy.
	12	33	28	58.6			45.10	30		N W b N.	Thick and foggy.
	9	31	27							S E.	Hazy, with ſmall Rain.
28	9	29	28							S S E.	Foggy, with much Rain
	12	29	29	58.18			47.16	31		S W.	Hazy, with ſmall Rain.
	9	32 ½	29 ½							W S W.	Freſh Gales, with Fogs.
29	9	33	29 ½							W S W.	Little Wind, and hazy.
	12	33	29	58.29			47.41	31		S W.	Fair and clear ; ſome R
	9	32 ½	28 ½							S S W.	Foggy and wet.
30	9	30	28 ½							S b W.	Squally.
	12	29	28 ¾	58.53			51.16	33		Dit.	Freſh Gales, and hazy.
	9	28	29 ½							S W.	Freſh Gales, Fogs, and R
July 1	9	27 ½	30 ½							W b S.	☿ 2 ½ D. above chang. ſte
	12	31	30 ½	59.49			54.56	34		West.	—fell 1 D. belo. chang.
	6	32	30 ½								—fell. Small Rain, & h
2	9	32	30							Calm.	Calm. Somewhat haz
	12	32	28 ¾	60.16	60.16	Obſ.	55.4	34		Calm.	—at a Stand, fair and c
	9	32 ½	29							Dit.	—ſomew. fall. light, & c
3	9	33	30							North.	Cloſe and grey Weather.
	12	33 ½	31	60.08			56.22	34		N b E.	—contin. to fall, clear, &
	9	33	30 ½							North.	—riſing a little, fair & c
4	9	31	29 ½							N N W.	—riſing, fair with fly. C
	12	30	29	59.33	59.33	Obſ.	58.10	37	Obſ.	N W.	—riſing, lit. Wind, & ſm.
	9	29	28 ½							North.	Cloſe, lit. Winds & fly. C
5	9	30	29							N W b N.	Light Air, and variable
	12	31	28 ½	59.33			58.28	37		Calm.	—fallen, fair and clear.
	9	31	28 ¾							Dit.	—at a ſtand, fair Wea
6	9	31	28 ½							N N W.	—at a ſtand, cloſe, & lit. W
	12	31	29	60.2			58.40	37		N N W	—at a ſtand, little Wind
	9	31	29							N E.	—at a ſtand, cloſe, & clo
7	9	31 ½	30 ½							N N E.	—ſome. fall. clear w. C
	12	31	30	60.9			60.22	37.40		Calm.	Cloſe and grey Weather
	9	30 ½	29						Obſ.	S W.	—riſing, lit. Wind & h
8	9	31	29 ½							S E.	Cloſe and foggy.
	12	31	30	60.29	60.30	Obſ.	61.23	38		N E.	Dit.
	9	31	29							W b N.	Dit.
9	9	34	34							S W b S.	—fallen 4 Deg. clear &
	12	34	33 ½	61.16	61.19	Obſ.	63.57	38	Obſ.	Dit.	Fair, clear, much Ice in
	9	33	32								—riſing, fair and clear.
10	9	32	32	Acc.						E S E.	—riſing, fair and clear.
	12	32	32	61.35	61.25	Obſ.	65.17	40		Dit.	—at a ſtand, fair and c

nths d ys.	Hours.	Barom. Alt.	Therm Alt.	Lat. p. Davis, or Act	Lat. p. Elton.	Obſ.	Long.	Variat.	Obſ.	Winds.	Weather.
10	9	32	32								☿ ſtands, freſh Gale.
11	9	34	33 1/3	Acc.						S E b S.	—fallen, freſh G. with Squalls
	12	34	33 1/3	62	62.4	Obſ.	69.2	41		S E b S.	—at a ſtand, freſh Gales.
	9	34	33							Dit.	—at a ſtand, hazy.
	9	37	32 1/2							Dit.	—fallen, fair.
12	12	36	30 1/2		62.33	Obſ.	71.2	43		W S W.	—ſomewhat riſing, fair.
	9	35	30							Dit.	—riſing, little Winds, & fair.
	9	35	29 1/2	Acc.						Dit.	—at a ſtand, fair with Calm.
13	12	35	30	62.46	62.40	Obſ.	72.6	43		N W.	Fair and moderate.
	9	35	30 1/3							N W.	Fair and clear.
	9	35	32							Dit.	—at a ſtand, fair and clear.
14	12	35	32	62.30		Obſ.	73.33	41		North.	—at a ſtand, fair and clear.
	9	35	32							N W b N.	Fair, ſerene Weather.
	9	34 1/2	32	Acc.						South.	—ſomewhat fallen, foggy.
15	12	35	33 1/2	63.13	63.14	Obſ.	75.9	41		S b E.	Very foggy.
	9	35	33 1/2							S E.	—at a ſtand, foggy.
	9	35	33	Acc.						N W.	—at a ſtand, fair and clear.
16	12	35	32	63.21	62.58	Obſ.	77.3	42		N N W.	Fair, ſerene Weather.
	9	35 1/2	31 1/2							Dit.	—falling, clear.
	9	34 1/2	31							N W.	—riſing, clear.
17	12	33 1/2	30 1/2	63.17			78.29	41		Dit.	—continues riſing, clear.
	9	33	30 1/2							North.	—riſing, ſerene Weather.
	9	33 1/2	31	Acc.						N W.	Foggy.
18	12	34	31 1/2	63.9	63.6	Obſ.	79.53	40		Dit.	☿ a little fallen, thick Fog.
	9	34	31 1/2							South.	—at a ſtand, hazy.
	9	33 1/2	31 1/2							East.	—riſing, freſh Gale.
19	12	33	30 1/2	62.14		Obſ.	80.44			E b N.	—contin. riſing fair, & clear.
	9	30 1/2	29							Dit.	—continues riſing, ſerene.
	9	28	27							Weſt.	—riſing, grey cloſe Weather
20	12	28	26 1/2	61.18			81.26	37		Dit.	—ſtands, freſh Gales, & foggy.
	9	30	29							N W.	—fallen, hazy.
	9	32	30							North.	—falls, fair, and clear.
21	12	32	29	60.5		Obſ.	83.2	34		N W.	—ſtands, freſh Gales, & fair.
	9	32	29 1/2							Dit.	—at a ſtand, ſqually.
	9	34	31							N W.	—fallen, moderate, and fair.
22	12	34	31	58.4		Obſ.	84.20	30		Weſt.	—at a ſtand, fair.
	9	33	31							W S W.	—riſes, dark and cloudy.
	9	32	31							W B N.	—riſing, dirty and Rain.
23	12	32 1/2	31 1/2	57.35			84.20	29		W b S.	—ſtands, foggy, & ſmall Rain.
	9	33	32							N W.	—fallen, freſh breeze & cold.
	9	37	34	Acc.						N W.	—fallen 4 Deg. incloſ. w. Ice
24	12	37	33 1/2	56.13	56.20	Obſ.	85.27	25		Weſt.	—ſtands, foggy and much Ice
	9	36 1/2	32 1/2							Calm.	—riſing, ſerene.
	9	36	32	Acc.						SSE	—riſing, hazy.
25	12	35	31 1/2	56.24	56.24	Obſ.	85.27	24		East.	—continues riſing, fair.
	9	35	32							S E b E.	—ſtands, hazy, and cold Air.
	9	35	33							S S E.	—ſomew. fall. hazy, & cold.

July

Months and Days.	Hours.	Barom. Alt.	Therm Alt.	Lat. per Accou^{t}.	per Davis.	per Elton.	Long.	Variat.	Obſ.	Winds.	Weather.
July 26	12	36	33 1/2	55.39		55.33	85.40	24		N b E.	☿ falling, Rain, & freſh
	9	36	34							N N W.	—ſtands, thick and r
27	9	37	35							E N E.	—contin. falling, fair &
	12	37	34 1/2	54.23			85.48	24		E b N.	—ſtands, cold, & much
	9	37	35							N b E.	—as above, freſh Gale,
28	9	37	34 3/4							N b W.	—as above, moder. &
	12	37	34 1/2	53.57				24		N N W.	—ſtands, moderate &
	9	35	30							S W.	—riſing, fair, pleaſ. We
29	9	35	30 1/2							S W b W.	—at a ſtand, cloudy w
	12	34	31	53.29				25		S W.	—riſing, Thunder and
	9	33	31								—riſing, freſh Gales w.
30	9	37	32							N N W.	—much fallen, moder
	12	36	29								—riſing, fair and mode
	9	35	29 1/3								—contin. riſing, fair, &
31	9	31	27								—riſing, ſqually, with
	12	31	27								—as above, fair and mod
	9	29	25								—riſing quick, fair.
Aug. 1	9	26	22								—contin. riſing, warm &
										W N W.	Hazy and moderate.
Aug. 2	9	30	35								
	12	33	27	52.40		52.42			Obſ.	N N W.	☿ ſtands, hazy.
	9	35	30							Dit.	—ſtands, freſh Gales.
21	9	36 1/2	30							North.	—ſomewhat fallen, fair.
	12	37	31	52.54	52.55				Obſ.	North.	—fallen.
	9	37	30 1/2							Dit.	—falls, clear, ſerene, &
22	9	36	28							S W b W.	—riſes, fair light Breeze
	12	36	29	52.57	52.59				Obſ.	Dit.	—ſtands, clear, and cal
	9	35	29								—ſomewhat riſen, calm
23	9	34 1/2	29							S S E.	—riſes, hazy.
	12	34	29	53.54						Dit.	—contin. riſing, freſh G
	9	33	30							S b W.	—riſing, hazy, drops of
24	9	32	28 1/2							S E.	Fair and moderate.
	12	32	29	55.16				25		S E.	Hazy.
	9	33	30							N E.	Hazy and cloſe
25	9	34	30 1/2							N N E.	☿ falls, foggy, and cold.
	12	35	31	55.48				26		Dit.	—continues fallen, cold
	9	34	31							Dit.	—little riſing.
26	9	36	33							E S E.	—fallen, moderate, and
	12	36	33	56.55	56.56	56.56		28	Obſ.	Dit.	—ſtands, freſh Gales.
	9	37	34							E b N.	Hard Gales
27	9	40	34							E N E.	—fallen, freſh Gales.
	12	40	34	58.14	58.13			29	Obſ.	Dit.	Hard Gales.
	9	40	34							E NE.	—ſtands, moderate.
28	9	38	33							N N E.	—ſomewhat riſen, fair.
	12	38	32	58.35	58.41			30	Obſ.	North.	—ſtands, fair and mode

A

Months and Days.	Hours.	Barom. Alt.	Therm Alt.	Lat. Acc^{t}.	Lat. *p. Davis.*	*per Elton.*	Long.	Variat.	Obſ.	Winds.	Weather.
Aug. 28	9	38	32							North.	Fair and calm.
29	9	37	31							Dit.	Fair and clear.
	12	37	30	59.24	59.33			31	Obſ.	N b W.	☽ little riſen, fair.
	9	36	30							Weſt.	—ſtands, fair Weathe.
30	9	36	31							Calm.	—ſtands, variable.
	12	37	30	59.55	60.5			31	Obſ.	E S E.	—ſomewhat fallen.
	9	37	30							E b N.	—ſtands, ſqually.
31	9	39	35							E N E.	—fallen, freſh Gales.
	12	40	37	59.55				32		Dit.	—cont. fallen, fr. Ga. & lou.
	9	40	37							Dit.	—ſtands, ſqually.
Sept. 1.	9	40	36							N E.	—ſtands, great Sea.
	12	40	36 ½	59.25				31		Dit.	
	9	41	36								
2	9	42	36 ½							E N E.	—fallen, flying Cloud.
	12	43	36 ½	59.43	59.36			32	Obſ.	Dit.	—contin. falling, moderate.
	9	42	34							N N W.	Moderate.
3	9	41	35							S W.	—riſing, freſh Gales.
	12	40	35 ½	60.40				33		Dit.	—contin. riſing, hard Gales.
	9	35	35							Dit.	—riſing faſt, very hard Gales.
4	9	32 ½	32 ½							Dit.	—ſtill riſing, blow. ver hard
	12	31	33	61.33				35		Dit.	—continues riſing, foggy.
	9	30	33							W S W.	Thick Fog.
5	9	34	33							N b E.	☾ fallen, freſh Gales.
	12	37	35	62.12				38		Dit.	Freſh Gales.
	9	38	35 ½							Dit.	—continues fallen, moder.
6	9	42	37							N E b N.	—ſtands, hazy, Snow.
	12	42	36 ½	62.37		62.49		42	Obſ.	Dit.	—ſtands, thick Weathr.
	9	42	36 ½							S E.	—the ſame.
7	9	42	37								Cont. hazy, w. Ledges of Ice.
	12	42	37	63.10		63.21		42	Obſ.	S E.	Dit.
	9	42	36 ½							Dit.	The ſame, Fogs and Freez.
8	9	41	36							E S E.	☿ ſomewhat riſen, fogy.
	12	41	35 ½	63.25				41		Dit.	—ſtands.
	9	41	35 ½							Dit.	—the ſame, fair.
9	9	41	35							Calm.	—the ſame.
	12	40	34 ½	63.19		63.13		40	Obſ.	N W b W.	—ſomew. riſen, fair.
	9	41	35 ½							Dit.	—fallen, fair.
10	9	42	37							N b W.	—continues fallen, fair.
	12	42	38	62.48	62.30			41	Obſ.	Dit.	—the ſame.
	9	43	38							Dit.	—fallen, fair.
11	9	44	38							Dit.	—fallen, fair.
	12	45	38 ½	61.43				40		Dit.	—contin. fallen, fair & cold.
	9	45	38							North.	—at a ſtand, fair.
12	9	44	37 ½							W N W.	—riſen, fair.
	12	42	36 ½	61.31	61.29			40	Obſ.	Weſt.	—riſen, hazy w. much Ice.
	9	41	36							Dit.	—riſing, fair and clear.

Months and Day.	Hours.	Barom. Alt.	Therm. Alt.	Lat. Act.	Lat p. Davis.	Lat. p. Elton.	Long.	Need. Variat.	Obſ.	Winds.	Weather.
Aug. 13	9	40½	36							N W.	Fair.
	12	40	36	61.16	61.5		60.18	38	Obſ.	Dit.	Fair and moderate.
	9	40	36								Q the ſame, cloudy.
14	9	40	35½							N W.	—the ſame, fair.
	12	39	35	60.36			57.12	38		Dit.	Fair and cloudy.
	9	38	35							N W b N.	—riſing, hazy, with Snow.
15	9	37	35½							N N E.	—riſen, foggy.
	12	37½	36	59.41	59.28		52.29	35	Obſ.	Dit.	Fair.
	9	37½	35							N W.	
16	9	37½	34½							Weſt.	—ſtands, cloudy.
	12	37½	33½	58.20	58.10		47.18	33	Obſ.	N W b W.	—the ſame, cloudy.
	9	37½	33½								—ſtands, variable.
17	9	37	33							N N W.	—the ſame, cloudy.
	12	37½	33½	57.15			43.44	29		Dit.	—ſomew. fallen, cloudy.
	9	37½	33							Dit.	Calm.
18	9	27	28½							S W.	—riſing quick, freſh Gales.
	12	26	28½	56.35	56.25		42.32	27	Obſ.	Dit.	—little riſing, cloudy.
	9	26	28½							Weſt.	—ſtands, ſqual. with Rain.
19	9	34	29							N W.	Clear, with freſh Gales.
	12	35	30	55.23	55.29		38.48	25	Obſ.	Dit.	—ſtill falling, fair.
	9	35	31							Dit.	—ſtands, fair, ſqually.
20	9	34	30½							W N W.	—riſing, ſqually with Hail.
	12	33½	31	54.23			34.19	22		Dit.	Hard Squalls.
	9	33½	31								—at a ſtand, hard Squalls.
21	9	33	30							N W.	Squally with freſh Gales.
	12	33	29½	53.9			29.51	20		Dit.	—ſtands, clear freſh Gales.
	9	34	29							Dit.	—ſomewhat fallen.
22	9	34	28½							N b W.	—ſtands, fair.
	12	35	28	52.7	52.14		26.25	19	Obſ.	N W b W.	—fallen, clear.
	9	30	25							S W.	—riſing quick, cloudy.
23	9	28	25							S b E.	—ſtill riſing, hard Gales.
	12	24	24							Dit.	—riſing quick, thick & dirty
	9	21	21								—continues riſing.
24	9	22	22							Eaſt.	—ſtands, cloudy and Rain.
	12	22½	22½	52.30			23.12	17		Dit.	Dit. freſh Gales.
	9	22½	22½							Dit.	—at a ſtand, cloudy.
25	9	21½	22							South.	—riſing, ſqually and Rain.
	12	21½	22	51.50	51.54		20.24	16	Obſ.	Dit.	—the ſame, freſh Gales.
	9	21	22							W S W.	—the ſame, ſqually w. Rain.
26	9	21	21½							S W.	Fair, freſh Breeze.
	12	21	21½	50.38	50.46		17.12	16	Obſ.	S b W.	Fair and clear.
	9	21	21							Dit.	—the ſame, freſh Gales.
27	9	22	21							Weſt.	—lit. fallen, fair and cloudy.
	12	23	20½	49.28	49.28		13.26	15	Obſ.	Dit.	Fair.
	9	22	20							S W.	A great Sea, ſqually.

Aug.

Months and Days.	Hours.	Barom. Alt.	Therm Alt.	Lat. Ac^{t}.	Lat. *Davis.*	Lat. *Elton.*	Lo	Need. Variat.	Obſ.	Winds.	Weather.
Aug. 28	9	20	19							S W.	☿ riſing, freſh Gales & Rain.
	12	19	18	49.15	49.2		9.21	14	Obſ.	Dit.	—contin. riſing, freſh Gales.
	9	21	18							W S W.	—little fallen, fair Weather.
29	9	23	18							S b W.	—fallen, hazy, freſh Gales.
	12	22	18	49.32			5.18	14		Dit.	
	9	22	18							S W b S.	—at a ſtand, freſh Gales.
30	9	22	18							Dit.	—the ſame, hazy.
	12	22	18	49.18	49.30			14	Obſ.	S W.	—at a ſtand, hazy.
	9	22	18								—contin. the ſame, ſqually.
Oct. 1.	9	24	17							Weſt.	—fallen, fair and clear.
	12	26	19	50.2				14		W S W.	—continues fallen, fair.
	9	28	21							Dit.	—fallen, fair and clear.
2	9	29	21							Dit.	
	12	29	21							Dit.	—continues, pleaſant.
	9	30	22							Dit.	—the ſame, fair and clear.

January 28, 173½.

SIR,

THESE will inform you of my Sentiments concerning Mr. *Patrick*'s Marine-Barometer, which I have made uſe of for two Voyages to *Hudſon*'s-Bay in North *America*, and by the ſtricteſt Obſervations, I have always found it to give me timely Notice of all bad Weather, and likewiſe of veerable Winds; as alſo, certain Intelligence of our coming nigh any Ice, with the Quantity we had to go through. It is an Inſtrument of excellent Uſe, I having continually found myſelf obliged to conform to its more certain Information before all other ocular Appearances in the Horizon whatever. I muſt likewiſe inform you, that when we come in or near Ice we are obliged to keep one of our Compaſſes continually moving, there being either ſome magnetick Particles in the Air, or ſome other Quality that hinders them from traverſing, which makes our Courſe very difficult to direct; this happens generally in our entring *Hudſon's*-Streights and Bay, but never ſo without being near or amongſt Ice. I have enquired of the Commanders, and others that uſe *Greenland* and *Davis*'s-Streights, and find great Complaints from them of their Compaſſes not traverſing. I have tried the Needle of the Azimuth Compaſs without the Chart, and find it to traverſe much better, ſo that I deſign next Voyage to have iceing-glaſs Charts, as being lighter. I ſubmit the Conſideration of theſe Things to yourſelf and the Learned, and remain,

SIR,

Your moſt Humble Servant,

Chriſtopher Middleton.

***To Mr.* Benj. Robins.**

XI. *Obſervatio Eclipſis Solis totalis cum mora facta* Gothoburgi Sveciæ, *ſub elev. Poli* 57° 40' 54", *d.* 2 Maij, *ſtylo Jul. An.* 1733, *à Dom.* Birgero Vaſſenio, *Lectore Mathem. in* Gymnatio *Regio* Gothoburg.

INitium Eclipſeos, quod ob nubes interpoſitas animadverti non potuit, antæ 6ʰ 26' poſt mer. incidiſſe videtur.

6ʰ 38' 43" ad tres fere digitos obſcurabatur Sol.
6 49 52 ad ſex plus minus digitos.
7 14 6 adparebat ♃.
7 14 46 incepit totus tegi Solis diſcus.
7 15 50 Maximæ tenebræ, cum ſtellæ omnes urſæ majoris, cor ♌, Sirius, Procyon, Oculus ♉, & nonnullæ aliæ videri poterant: non tamen ☿ neque ♂ conſpecti.
7 16 54 Cum incredibili celeritate Sol radios ejacularicœpit.
7 20 12 adparebat adhuc ♃.
7 41 38 ad ſex digitos Sol tegebatur.
8 5 50 finis Eclipſis, toto lucente Solis diſco.

Mora Eclipſeos totalis *Gothoburgi Sveciæ*, 2' 8".

Mora hujus Eclipſis totalis in loco quodam *Swenaker* dicto, ſeptem milliar. Svethic. hinc verſus Septentrionem diſtante, ſub Elev. Poli 58°. 15', ut ope penduli oſcillatorii obſervavit Frater meus Germanus *Torſtanus Vaſſenius*, erat 2' 31"

Tempore,

Tempore, quo Sol totus tegebatur, præter maximam partem macularum in disco, atmosphæram Lunæ, per Telescopium 21 fere pedum *Sveth.* vidi; eamque in limbo Lunæ occidentali, sub maxima immersione, paulo lucidiorem; absque tamen irregularitate illa & inæqualitate luminosorum radiorum, quæ in oculos sine tubo intuentium incurrebat. Admiratione non solum, sed & judicio Illustrissimæ *Regiæ Societatis* maxime dignæ videbantur subrubicundæ nonnullæ maculæ in illa, extra peripheriam disci Lunaris, conspectæ, numero tres aut quatuor; quas inter una erat ceteris major, medio fere loco inter meridiem & occidentem, quantum judicare licuit. Composita hæc erat tribus quasi partibus seu nubeculis minoribus parallelis inæqualis longitudinis, cum aliquali obliquitate ad peripheriam Lunæ. Admiratus Phænomenon Socio, qui lynceis erat oculis, copiam videndi feci. Ceterum, cum is tubo non adsvetus ne quidem lunare corpus inveniret; ipse iterum eandem maculam, aut, si mavis, nubem invariatam situmque pristinum in Atmosphæra prope ad peripheriam Lunæ occupantem, sine omni suspicione vitii tubi aut oculi, per 40 aut plurium minutorum sec. tempus lætus perspexi. Tandem vero radius Solaris, fulguris instar, in boreali Lunæ limbo emissus oculo Mercurium fere perigeum in tanta festinatione frustra inquisituro jucundissimum hoc Spectaculum, exspectatione citius, subduxit.

Gothob. 20 *Jun. stylo Jul. Anni* 1733.

XII. *Pro-*

XII. *Propoſals for the Improvement of the Hiſtory of* Ruſſia, *by publiſhing, from time to time, ſeparate Pieces to ſerve for a Collection of all ſorts of* Memoirs *relating to the Tranſactions and State of that Nation: Printed at* St. Peterſburg, *for the* Imperial Academy *of* Sciences. *By* Ger. Fred. Muller, *Prof. Hiſt. Petropol. and F. R. S. Tranſlated from the* German *by Mr.* Zolman.

THE Hiſtory of the Empire of *Ruſſia* and its Provinces and Territories incorporate, has, 'till now, laboured under ſuch Difficulties, that it almoſt ſeems impoſſible to produce any Syſtem of it under twenty or more Years to come. For this Reaſon the *Academy of Sciences* have lately taken a Reſolution, for the Benefit of Lovers of Hiſtory, to begin a Collection of all ſorts of ſhort Treatiſes, and authentick Documents relating to the Hiſtory of that Empire, and to publiſh it, from time to time, in ſeparate Pieces, both in the *Ruſſian* and the *German* Languages. Their Intention in general is the ſame with what is aimed at in other Countries, by publiſhing Collections of Pieces of Hiſtory and Records, *viz.* on one Side to gather Materials for a future compleat Hiſtory, and on the other, to animate ſuch Perſons as have already made Collections with this View, to contribute their Part towards the publick Advantage. But their particular View in this Work is to bring to light, from time to time, all that has hitherto remain-

ed unknown to Foreign Nations about the *Ruſſian* Hiſtory, or has not yet been ſufficiently enquired into, nor cleared up in printed Hiſtories. For this Reaſon we ſhall take the Hiſtory of the *Ruſſian* Empire in its largeſt Extent, ſo as to comprehend not only the Hiſtory both Civil and Eccleſiaſtical, Learned, and Natural, but alſo the Antiquities, Medals, Chronology, Geography, *&c.* of that Empire, not only with reſpect to the *Ruſſian* Nation, particularly and properly ſo called, but alſo with regard to all the other Kingdoms and Provinces ſubject to the *Ruſſian* Sceptre, nay, even to the neighbouring Parts of South *Tartary*. The Firſt Part, which will ſpeedily be publiſhed, ſhall ſerve for a Specimen, how far theſe Endeavours will meet with the Approbation of ſkillful Readers. In caſe this is well received, we will go on with others every Month, or thereabouts, ſo as to make up at the End of the Year a ſizeable Volume in *Octavo*, the 12th Part of which ſhall conclude with a complete Table for the whole Volume. Theſe are therefore to deſire ſuch Perſons as are provided with proper Materials for our Deſign, and are enclined to communicate them to the World, in their own Names, or without mention of them if they had rather, to ſend them either in the *Ruſſian*, or any other Language, into the Secretary's Office of the *Academy of Sciences*, in order to which, the following Specification will ſhew in what manner the different Materials may be ranged and publiſhed.

St. Peterſburg,
Sept. 9, 1732.

Specification

Specification of the Materials, *which are to ſerve for the intended* Collection.

I.

Extracts and Tranſlations of all the Hiſtorical Manuſcripts and Chronicles of *Ruſſia*, as are either already extant, or may hereafter be diſcovered.

As for Inſtance, out of the *Stepennaia Kniga*, the *Chronicon*, or *Synopſis Kiovienſis*, the Chronicle of the Abbot *Theodoſius* of *Kiow*, the Chronicle of *Barlaam Palizin*, ſome anonymous Chronicles, *&c.*

II.

Hiſtories of the Lives of the moſt celebrated Sovereigns of *Ruſſia*, of either Sex, carefully gathered from proper Accounts, Printed, as well as Manuſcripts.

For Inſtance, the Lives of *Ruric*, *Igor*, *Olga*, *Wladimir* the Great, *Wladimir Monomachus*, *Alexander* of *Neva*, and all the other Czars, Emperors, and Empreſſes, from *Iwan Baſilowitz* the Firſt, to the preſent Time.

III.

Genealogical Accounts and Tables, both ancient and modern, of the Family of the Great Dukes, Czars, and Emperors of *Ruſſia*.

For this I have prepared and drawn up twelve Tables, repreſenting, moſt diſtinctly, the Succeſſion of the ſeveral Great Dukes, Czars, and Em-

Emperors, from the Great Duke *Ruric*, down to the preſent Empreſs, with their ſeveral collateral Branches, as far as there is any Notice to be had of them; Princes who had only Allowances from the Crown; Princeſſes married, or unmarried; as alſo, the intruded Sovereigns, who filled the Throne during the Troubles of ſeveral Interregnums.

IV.

A Geographical, Chorographical, and Topographical Deſcription of all the Countries, Territories, and Towns ſubject to the Sceptre of *Ruſſia*.

For Inſtance, A compleat Geography of *Livonia*, *Eſthonia*, *Ingria*, and *Carelia*, and afterwards alſo of other Governments and Territories, taking, at the ſame time, notice, in a few Words, of the Hiſtory of each City, or Town. Alſo, Deſcriptions of particular Cities, and what is remarkable in them, as *Moſcow*, St. *Peterſburg*, &c.

V.

An Explanation of all the *Ruſſian* Coins and Medals both ancient and modern.

Under this Head ſuccinct Accounts may be given of the diverſe Tranſactions which occaſioned the coining of them; particularly, the Hiſtory of the Arms of *Ruſſia*, deduced from their Coins and Medals.

VI.

A Deſcription of all kinds of *Ruſſian* Antiquities, Natural Curioſities, &c.

For the firſt, the Imperial Cabinet here will furniſh a ſufficient Store; as for Inſtance, Idols of Gold, Copper, and Iron, Ornaments for Dreſs, Veſſels, and other Antiquities, which were from time to time found in *Siberia*. On the other Head, an Account of the Mineral Waters at *Olonitz*; the flying Squirrel, the Asbeſtus, the Mammot, and other natural Curioſities peculiar to *Ruſſia* and *Siberia*, not to be met with in other Countries.

VII.

All that relates to the Eccleſiaſtical Hiſtory, or can contribute to the illuſtrating of it.

For inſtance, of the Idolatry of the ancient Inhabitants of *Ruſſia*; of their Converſion to the Chriſtian Religion; of the Endeavours uſed by the Church of *Rome* for uniting with the *Grecian*, and particularly that of *Ruſſia*; of the Succeſſion of the *Ruſſian* Metropolitans and Patriarchs; of Archiepiſcopal and Epiſcopal Sees, of Convents, &c.

VIII.

Diverſe Tranſactions relating to the Hiſtory of Learning in *Ruſſia*.

Such are, A Hiſtory of the Schools and Academies of *Ruſſia*; of the Uſe of Characters, and the Introduction of the Art of Writing; of the Riſe

Riſe and Progreſs of Printing in *Ruſſia*; a Liſt of all the Books printed in *Ruſſia* to this time.

IX.

Diverſe Particulars and Miſcellaneous Subjects gathered out of various Parts of their Hiſtory.

For Example; The Conqueſts of the Country of *Siberia*, and Kingdoms of *Caſan* and *Aſtracan*; of the Manners and Cuſtoms of the different Nations of *Siberia*; of their ſeveral Languages; of the planting of *America* from *Siberia*; the Hiſtory of the Commerce of *Ruſſia*; of the Tribute anciently paid to *Ruſſia* by the *Livonians*; the Hiſtory and Deſcription of the Globe of *Gottorp*; the Hiſtory of the Navigation by the North-Eaſt Paſſage; particular Advices concerning the Country of *Kamtſchatka*, &c.

X.

Extracts of Books and Papers publiſhed here by the Academy of Sciences, as far as they chiefly relate and contribute to the ancient and modern Hiſtory of *Ruſſia*, Civil or Eccleſiaſtical, or of Literature and Nature.

Under this Article will be ranged, among others, ſome Treatiſes of Profeſſor *Bayer*, relating to the ancient Hiſtory and Geography of *Ruſſia*; as likewiſe, Dr. *Duvernoy*'s Anatomical Accounts which relate to Natural Hiſtory, with his Deſcription of ſome Monſters produced in *Ruſſia*.

XI.

Discoveries of Errors committed by Foreign Authors in the History and Geography of *Russia*.

Under this Head the most modern Authors will be chiefly taken notice of, as they are most likely to produce new Mistakes. Accordingly two Treatises lie ready on this Subject, the one containing Observations on M. *Strahlenberg*'s Northern and Eastern Part of *Europe* and *Asia*, as also on his Map; the other on the *Origines Russicæ* of M. *Schöttgen*, Rector of the School at *Dresden*.

XII.

Diverse Historical and Geographical Accounts of the neighbouring *Tartarian* Kingdoms and Countries, with which *Russia* has a constant Intercourse, but are otherwise little known.

Such are the *Cosacks*, the *Tartars* of *Crim*, *Dageſtan*, *Nagaya*, *Chiwa*, *Bucharia*, *Calmucks*, *Mongals*, and others; of the History of their Government; of the Description of their several Countries, as to their Situation, Manners, Customs, Commerce, Religion, Language, Learning, Arts and Sciences, *&c.*

The Collector and Publisher is to be *Gerhard Frederick Müller*, Member of the Imperial *Academy of Sciences* of *Russia*, and of the *Royal Society* of *England*, as also Professor in Ordinary of History: But in his Absence, this Work is carried on by his Collegue in the Professorship of History, *Adolphus Bernardus Cramer*.

XIII. *An*

XIII. *An Account of an Experiment contrived by* G. J. s'Graveſande, *Prof. Math. at* Leyden, *F. R. S. relating to the* Force of moving Bodies, *ſhewn to the* Royal Society, *by* J. T. [illegible], *LL. D. and F. R. S.*

HAving [illegible]r ſhewn ſeveral Perſons in *Holland* the Experiment contrived by Mr. *Geo. Graham*, to explain the Doctrine relating to the *Momentum* of Bodies (*viz.* That the *Momentum* or Quantity of Motion in Bodies is always as the Maſs multiplied into the Velocity) which Experiment is made with a flat, pendulous Body, that receives the Addition of a Weight equal to itſelf at the lower Part of its Vibration, and by the Reception of that equal Quantity of Matter always loſes half its Velocity. Dr. *Muſchenbroek*, Profeſſor of Mathematicks and Aſtronomy at *Utrecht*, communicated to me the following Experiment, made in Oppoſition to that which I ſhewed, by Mr. Profeſſor *s'Graveſande*. In this laſt a Spring equally bent every time, puſhes forward, unequal Quantities of Matter ſucceſſively, and in every Experiment the Product of the Maſs of the Body by the Square of the Velocity is the ſame; and therefore, as the Quantity of Motion muſt always be the ſame from the ſame Cauſe (*viz.* the ſame Tenſion of the Spring) it follows, by every Experiment, that it is as the Maſs multiplied intothe Square of the Velocity.

Exp. 1.]

Exp. 1.] The pendulous Cylinder is ſhot by the Spring from 0 Deg. to 7 Deg. meaſured upon a Tangent Line.

Exp. 2.] The Cylinder with a leaden Weight in it that makes its Weight double, is ſhot [illegible] 4 Deg. and 9 Tenths.

Exp. 3.] The Cylinder with [illegible] made its Weight triple, was ſhot [illegible] and a little farther.

Exp. 4.] The Cylinder with a triple Weight of Lead ſo as to quadruple the whole Weight, was ſhot forward to 3 Deg. and an half.

Theſe 4 Experiments at firſt ſeem agreeable to the new Hypotheſis; for according to the old, the Cylinder in the 2d Experiment ought to have gone but to $3\frac{1}{2}$ Deg. in the 3d Experiment but to $3\frac{1}{7}$ Deg. and in the laſt but to 2 Deg.

But if we take in the Conſideration of Time, all will be reduc'd to the old Principle. As for Example, let us compare the firſt and laſt Experiments.

In the firſt, the Spring during a certain time acts upon the Cylinder which is driven forward with the Velocity 8. When the quadrupled Weight is driven forward with the Velocity 4 inſtead of 2, it is becauſe the ſame Spring acts twice as long upon the Cylinder before it ceaſes to impel it; and certainly the ſame Cauſe acting twice as long muſt produce a double Effect.

FINIS.

Numb. 430.

PHILOSOPHICAL TRANSACTIONS.

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Jos: Banks

I. HER-

I. HERMANNI BOERHAAVE, A. L. M. *Philoſoph. & Med. Doct.* Medicinæ *in Univerſitate* Leidenſi *Prof. Colleg. Chirurgic. Præſ. R. S.* Lond. *necnon Reg. Scientiar. Acad. Pariſienſ. Soc. de* MERCURIO *experimenta.*

QUI rerum corporearum originem, vireſque harum ſingulares & proprias, per experientiam indagaverunt diligentiſſime, ſoli hi exploratos ſibi modos reddiderunt, quibus vera harum notitia certo comparatur. Quotieſcunque vero inſtrumenta hujus Scientiæ candidi enumerant, uno ſane ore fatentur, Chemiam, propoſito huic gnaviter promovendo, præſtitiſſe utiliſſima. Autores etiam hac in arte claros dum ſedulo excutiunt, liquido tum conſtitit, Alchemiſtarum vetuſtiſſimos cæteris palmam præripuiſſe, ubi de rerum natura commentantur. Geber teſtis eſto, & qui huic proximi. Hi quippe ſimpliciter ea modo deſcribunt, ſua quæ arte detexerant, cui quidem unice excolendæ curam omnem impenderant, alia ſollicitudine prorſus expediti. Nulli profecto mortalium indagini rerum naturalium acrem adeo, & pertinacem, operam dedere, aut verſandæ per varios explorandi modos materiæ improbum adeo laborem adhibuerunt, quam Alchemiſtæ. Ut autem, ita ſe hæc habere, faciles dabunt, qui Hermeticos evolvunt, quando inventa communia aperti enarrant; ſic quidem e contrario,

dum de arcano ſophorum differunt, eo celandi ſtudio abuti accuſantur, quaſi hic loci nollent intelligi. Paradoxa adeo, a cognitis aliena, & hyperbolica ſublimitate turgida, nova, jactare perhibentur, ut deliri, fabuloſi, mendaces, & vani, explodantur. Enimvero verbis ſeveri, divites promiſſis, rem interea ipſam atra adeo caligine condunt, ut arcana revelata nolle videantur. Sapientum ideo plurimi judicant, impoſſibile prorſus naturæ, & arti, quod promittunt: indignos quin imo cenſent, qui Philoſophis inſeri, aut ab iiſdem legi, mereantur. Artifici tamen tutius, quam ignaro, propria in arte creditur; & temeraria, quæ poſſibilia definiunt, mortalium judicia: Præcipue quidem, dum palam hi Chemiſtæ clamant, ſcripta ſua unice libranda ad leges naturæ certiſſimas, rerum eventis ſolide compertas; nolunt credi, ſi quid uſquam forte protulerint, quod adverſum ſit vere compertis per experimenta viribus naturæ. Imo aiunt contra, eo tantum hæc ab iis propoſito dici: ut profani a miſteriis procul abſint, quæ initiatis aperiuntur, hinc neceſſe fuiſſe, ut aliena, obſcura, ſæpe & falſa, ſinceris, liquidis, & veris, interpolarentur.

Contigit mihi chemica ſcrutanti, & evolventi Alchemiſtarum ſcripta, videre, unam eſſe mentem omnibus. Metalla ſuis in venis naturaliter gigni, ali, creſcere, multiplicari, ut cætera naturalia ſuo quæque loco. Alimenta etiam metallorum, alienæ prius indolis, vi genitali ſeminis metallici verti in naturam vere metallicam ita, ut, ſola hac ſeminali poteſtate amitterent priſtinam, novam acciperent hanc proprietatem, uno teporis prægnantis fotu. Fieri ſcilicet omnia hæc volunt eadem penitus ratione,

one, ut animantum, & ſtirpium, ſemina ſuum in nutrimentum accepta alimenta mutant. Sic auri vegentis vivificans ſemen, nactum apta pabula, in matrice idonea, ope convenientis caloris, in ſingularem ſuam indolem eadem digereret. Ea ideo ratione, per legem ſubterraneis ſcriptam, ex materia diverſi ab auro ingenii, longa die, verum perpetuo naſci aurum, ſtatuunt. Vitali nempe augmento, ex alimento vi ſua ſubacto, in materiem ſibi ſimilem, creſcit; quamdiu quatuor conditiones illæ præſto manent. Has autem accuratius proſequuti deprehenderunt, nata metalla, aurum præcipue, detineri arctiſſime clauſa, ſolidum inter, & puriſſimum, ſaxum, quod undique quam ſollicitiſſime obſeratum nec aditum, nec exitum, dare cernitur. Matrix naſcentis metalli denſa, dura, impenetrabilis, ſincera, undique obturata, vitrum refert. Vix aliud difficilius intellectu, quam modum perſpicere, quo ſolidum metalli penetrare ſe potuerit per ponderoſam duræ ſilicis molem, uſque intra venas metallo prægnantes, & oneratas. Nec arduum minus, aſſequi, quanam tandem via clanculum tranſierit, in latentes latebras idem metallum, ſi prima in origine liquidum fuerat, ut valde probabile habetur. Matrix genuina metalli ſic cognita. Calor quoque fodinarum metalliferarum cognitus : raro æquat ſani teporem ; ſed crebro infra gradum ſexageſimum in thermometri Fahrenheitiani ſcala ſubſiſtit. Hinc & Myſtæ præcipiunt, ut fœta arcani materies, vitro incluſa puro, foveatur Majali colore. Hunc quinquaginta paſſim graduum experimur. Atque ille quidem ipſe medius compertus eſt toto anno, per obſervationes ſollicitiſſime inſtitutas induſtria Cruquiana. Obſcurius

manet pabulum metalli, ut & quæ ſit ſeminalis illa, prolifera, & genitrix, materies? Aiunt plerique, eſſe argentum vivum materiem omnibus communem metallis. Hoc potentia vitalis ſeminis mutatum dare metallum definitum juxta ſingularem proprietatem ſeminalis efficaciæ. Singula ergo metalla argento vivo, & hac vi metallifica (Sulphur dicunt) mature percoctis, perduci in ſpeciem perfectam ſingularis metalli. Hinc & in bina hæc reſolvi iterum unumquodque metallum. Ipſi tamen argento vivo, a prima nativitate, hæret originalis labes, intime concreta, miris cum eo modis inoleſcens; hinc difficillime ab eo ſeparanda. Non foret ideo argentum vivum, ſimpliciſſimum, neque liberum, ſed, per alienum illud inhærens, jam definitæ naturæ; atque propterea vix pateretur, ut, obſequioſum virtuti particularis ſeminis metallici, duceretur in naturam unius metalli ſingularem. Si vero arte difficillima repurgatur penitus ab ea peregrina macula, tum demum haberi liquidum; metallicum; ponderoſiſſimum; ſimpliciſſimum; nulla arte, nec natura, unquam in diverſa diviſibile; in quo ſoluti cujuſque metalli ſemen vivificatum, ſe perfectiſſime multiplicaret; in quo aurum ipſum deliqueſcens, fotum, maturatum, foret laboris ſupremum pretium, quæſitum adeo, adeo decantatum.

Quum viderem convenire ſuper his inter principes artis, diu molitus ſum, experiundo diſcere, quonam tandem artificio ſincerus queat parari Mercurius? an ex metallis poſſit ille elici? Quæ metalli illa ſit pars altera, ſua ſub juga liberum cogere apta hydrargyrum? Juvat comperta recitare: non qui artem doceam; abſum inde, ſi quis quam longiſſime. Sed

bona

bona fide narrabo experimenta laborioſa, & tam certa, ut pro veris haberi queant. Opus non erit deinceps aliis ea repetere, ſed his uti pro veris fas erit, quoties erit uſus. Poteritque diligens artifex, hæc aſſumens, ad alia ulterius applicare animum: quo ſtudia Chemiæ magis promoveat. Utinam privatos labores quiſque ad publica commoda contuliſſet! Primum eſto.

I.

Argentum vivum purum, vaſe vitreo, ſicco, ſincero, contentum, ſolo concuſſu mechanico agitatum, dat pulverem mollem, nigrum, tenuiſſimum.

OPERATIO.

Uncias ſedecim hydrargyri, emti a Societate Amſtelædamenſi, premebam per alutam; nulla fœx reſtitit. Trivi diu cum aqua pura; manſit hæc pura poſt tritum. Cum ſale marino diu contritus fuit; ſed color ſalis non inquinabatur. Affuſa aqua ad ſalem hunc & mercurium, contritio repetita; neque vel ita mutabatur color. In omni, hoc opere nigri nihil, nil peregrini aut ſpurci apparuit. Hydrargyrus dein ablutus, ſiccatus, erat ſplendidus. Eum fudi in lagenam vitream, ſiccam, ſinceram, de vitro Germanico obſcuro-viridi conflatam. Poſui ſimul in furno arenæ, ad ignem tantum non elevantem argentum vivum: quo eſſem certus, aquam, quæ crebro mercurio clam adeſt, omnem penitus expulſam, triduo ſic detinui. Subere puro, ſicciſſimo, ſolidiſſimo, in collum calidi adhuc vaſis intruſo quam

for-

fortiſſime obturavi vitrum. Apicem lagenæ ſubere clauſum immiſi cæmento fuſo de pice, reſina, ſebo, ſulphure. Linteum induxi adductis funibus arcte adſtrictum. Vitrum ita inſtructum indidi ciſtellæ ligneæ, ita capienti hanc lagenam, ut eam lateribus ſuis contingeret, furfures ſicci dein vacua inter vitrum, & ciſtellam, loca opplebant. Operculum ligneum perforatum in medio affixi ſupra, ut collum lagenæ parte ſuperiore ſua paulum emineret per id foramen. Erat vitrum immobile intra ciſtellam. Vitrum ſic paratum curavi affigendum ad caudicem tundentem molendinæ fulloniæ, noctes, dieſque, mobilis ; modo ſpiraret ventus ; a prima Martij anni 1732, ad decimam tertiam Novembris ejuſdem anni ; fuit ſemper ad perpendiculum elevatu, & demiſſu, conciſſum.

EFFECTUS.

Lagena aperta, idem pondus Mercurij, undique recti polline molliſſimo, nigerrimo, copioſo, tenuiſſimo. Preſſi per alutam puram ; tranſiit liquidus, purus, Mercurius. In aluta pulvis ille, ſaporis acris, metallici, ſaporem æris utcunque referentis.

COROLLARIA.

1. Argentum vivum, inſipidiſſimum ex ſe, ſolo quaſſatu fit ſaporis metallici ænei.

2. De mitiſſimo fit acre, penetrabile.

3. Ex ſplendidiſſimo argenti colore nigerrimum fit.

4. De fluido conſiſtens ſpecie pulveris.

5. Po-

5. Poteſt ergo ita latere ſub imagine talis pollinis; & fallere ignaros.

II.

Argentum vivum purificatiſſimum, ſic tractatum (1.) dat pulverem eundem longe majore copia.

OPERATIO.

Suſpicatus, forte quid hærere poſſe in argento vivo alienæ ab eo indolis, & motu ſeparari inde ſpecie illius pulveris; egi Mercurium ex cornuta vitrea igne arenæ totum; egreſſum refudi in eandem retortam, urſi igne, ut prius. Opus repetivi ſexagies. Erat Mercurius 61 vicibus deſtillatus. In fundo vaſis drachmæ quinque pulveris rubri. De quo poſtea. Mercurius vero hic valde agilis, nitens. Hujus uncias binas curavi conquaſſandas molendina fullonia, eodem prorſus modo (1.) opere, & tempore.

EFFECTUS.

Pondus idem. Pulvis natus mollis, niger, ſaporis acris, metallici, æs referentis, ad duas drachmas, & viginti ſex grana: igitur plus octava; dum venalis Mercurij vix $\frac{1}{128}$, eadem operatione verſa eſſet in pulverem.

COROLLARIA.

1. Mercurius 61 vicibus deſtillatus, inſipidiſſimus, ſit ſaporis metallici.

2. De

2. De mitiſſimo acris, penetrabilis.

3. Ex nitidiſſimo argenteo, ſpeculari, aterrimus.

4. De fluidiori, quam nativus fuerat, pulvis conſiſtens.

5. Igne diuturno, valido, toties repetito, retinet hanc proprietatem.

6. Quæ ergo non pendet a fœce peregrina Mercurij, inde per ignem ſeparabili.

7. Materies, a deſtillatione Mercurij, in fundo retortæ manens, rubra, ſplendens, acris, non eſt magis ſimilis nigræ, concuſſu natæ, quam ea pars, quæ manſit volatilis.

8. Igne, & quaſſatu, mutatur Mercurius, eo in rubrum, hoc in nigrum: eſt verſicolor.

9. An copia minore actus plus nigri dat?

III.

Pulvis nigerrimus (Op. II.) ex vitro ſi urgetur igne magno, redit in Hydrargyrum purum.

OPERATIO.

Drachmas duas, grana viginti ſex, de pulvere nigro (Op. II.) urſi igne valido, aperto, ex retorta pura vitrea, ut poſtremo per horas binas retorta canderet.

EFFECTUS.

Erant in excipulo drachmæ duæ, grana duo, argenti vivi puriſſimi, inſipidi, ſplendentis. Adhæſit lateribus vitri, quod commiſſum retortæ in vas aqua plenum

plenum definit, hinc inde aliquantum Mercurij, quod accurate colligere nequivi. In fundo retortæ macula fixa, parva subtilissime tenuis, visibilis modo.

COROLLARIA.

1. Mercurius Sexagies & semel destillatus, concussus, in pulverem descriptum versus, solo igne redit in antiquam formam.

2. De acri, penetrabili, fit mitissimus.

3. De aterrimo, argenteo nitore speculum purum refert.

4. Ex consistente pulvere fluidissimus.

5. Tribus his operationibus, manet in se idem; sub variis interim personis mutat speciem.

6. Sapor, & vis acris, mire in eo mutantur, solo motu, igne solo.

7. Interim pauxillulum fixi his operationibus nascitur ex Mercurio.

8. Nigrum id non erat fœx, vel alieni quid, a Mercurio sic separatum.

SCHOLIUM.

Mercurium in cucurbitis vitreis, conicis, fundo plano instructis, phiala chemica vitrea inversa clausis, exposui igni centum & octuaginta graduum per plures menses. Fiebat niger, deditque pulverem nigrum, similem omni dote: unde didici ignem, & quassationem idem agere in mercurium, hoc in gradu.

IV.

Mercurius ſimplici deſtillatione mutatur.

OPERATIO.

Argenti vivi venalis apud Societatem Amſtelædamenſem Uncias xviij ponderis Amſtelædamenſis, urſi ex cornuta vitrea, pura, igne arenæ, in excipulum aqua puriſſima, a fundo ad iv pollicum altitudinem, plenum, eouſque, ut nihil maneret Mercurij currentis in alvo vaſis. Mercurium ſiccavi, purgavi, charta bibula; pura ſicca: ut eſſet prorſum ſiccus, mundatus ab omni ſorde illapſa, & a nigro, quod in deſtillando evehitur una cum Mercurio qualibet vice deſtillationis. Dein fudi illum in eandem cornutam. Egi denuo, ut vice prima. Id ita repetivi quinquageſies & bis. In ſingulis deſtillationibus naſcebatur pulvis ruber, ſplendens, in retorta.

EFFECTUS.

Pulvis tum ad drachmas iv, cum ſemiſſe, poſt LII deſtillationes, acer, ruber, ſplendens, deorſum, ſurſum, purgans. Mercurius ſupererat ad Uncias xvj, drachmas v. Drachmæ ergo vj, & dimidia, perierant. Id caveri nequit: per gluten aliquid exſpirat; chartæ bibulæ nigri quid, & pauxillulum Mercurij, adhæreſcit, dum exſiccatio ſingulis vicibus fit. Parum id una vice; multiplicata vero opera aſſurgit ſenſim in partem notabilem. Pulvis natus erat ponderoſus, coloris rubri fulgidi, valde friabilis,

abilis, ſaporis acerrimi, metallici, nauſeoſi, penetrabilis, vix ex ore delendi, corpus humanum diu, & valide, turbans, ad excretiones diſponens. Mercurius ita tractatus fluidior vulgari apparebat.

COROLLARIA.

1. Hydrargyrus igne actus ita, vertitur de fluido in pollinem fere vigeſima octava ſui ponderis.

2. De nitore ſpeculi argentei in colorem fulgentem, rutilantem.

3. De inſipidiſſimo in acerrimum, horridum, metallicum, penetrabilem, ſaporem.

4. De mitiſſimo in acre virulentum, venenatum, perturbans corpus, dolores ciens.

5. De volatili in fixius, quod non eſt ampliusvolatile eo gradu ignis, quo prius avolabat.

6. Mutatur partem reliquam in fluidius, cætera ſimile.

7. Motus mechanicus, & parvus ignis, Mercurio nigrum, major ignis rubrum colorem, conciliat, vaſe clauſo.

V.

Scire geſtiebam, quid ultra fieret Mercurio, ſi porro urgeretur igne ad deſtillationem requiſito?

OPERATIO.

Uncias xv, drachmas v, Mercurij ſuperſtitis ab operatione (IV) curavi deſtillare, ut prius, eouſque, ut nil reſtaret in fundo. Egreſſum, depuratum, ſiccatum, ſemper effudi rurſum in retortam eandem.

Repetivi opus per quadringentas, quadraginta, & octo, diſtinctas vices. Erat Mercurius hic jam deſtillando actus quingentis vicibus perfecte. Genuerat ſemper quid rubri. Adſcenderat ſemper fluidior, purior. Ultimis vicibus urſeram ignem fortius, tum vero pulvis ille rutilus minui potius, quam augeri, videbatur : forte pro parte revivificatus.

EFFECTUS.

Pulvis in fundo retortæ ponderabat unciam, drachmas quinque, grana viginti & unum. Argentum vivum ſuperſtes poſt D deſtillationes ponderabat uncias novem, drachmas quinque: ſed contigerat in tot deſtillationibus ut aliquoties retortulæ fuerint fiſſæ, ſicque Mercurij quid effugerit, præter id, quod purgando, & ſiccando, tot vicibus repetitis perierat.

COROLLARIA.

1. Corallaria operationum (II & IV) in hac operatione etiam vera ſunt.
2. Mercurius valde immutabilis pro una parte.
3. Tamen aſſidue mutabilis pro parte altera.
4. Ex forma mutata in priſtinam forte redit ſpeciem.
5. Et forte regeneraſcens nova ignis actione iterum revolvitur in ſpeciem mutatam.

VI.

Argenti vivi proprietas, qua vertitur igne in pulverem hunc, deſtillatione ab eo vix aufertur.

OPERATIO.

Mercurium fluidiſſimum, puriſſimum, unde quingentis & una deſtillationibus confeceram uncias duas, drachmam, & grana quinquaginta & unum, (juxta II, IV, V.) ſuperſtitem pondere Unciarum decem, drachmarum quinque, cum ſemiſſe, deſtillavi ex retorta ſincera vitrea: ut Mercurius omnis penitus tranſiret in excipulum. Fundus cornutæ erat mundus, ac ſi recens ex fornace vitraria educeretur. Sed ad limbum ſuperficiei, qua ſteterat ante deſtillationem in ventre retortæ, erat annulus fulgens, pulchre rutilus, ſpecioſus, tenuis. Mercurium egreſſum, purificatum, ſiccatum refudi in eandem retortam. Urſi in excipulum. Id ita repetivi decies. Singulis vicibus fiebat plus de illo pulvere rubro. Neque vero parciore copia, quam ex Mercurio crudo.

EFFECTUS.

Mercurius vividiſſimus, nitidiſſimus. Pulvis fixus pulchre rutilus, cæterum ut (II, IV, V.) ad grana ſeptem.

COROLLARIA.

1. Mutabilitas Mercurij in hunc pulverem igne a net in eo, poſtquam octava ejus in pulverem verſa.

2. Poſt DXI deſtillationes manet, quæ ſingulæ aliquid fecere illius pulveris: licet nihil novi Mercurij additum fuerit.

3. Ergo

3. Ergo pulvis ille vix habendus pro fæce ſeparabili a nucleo Mercurij per deſtillationem.

4. Et hinc quidem conſtat, illum hac ope ita mutari; certum non eſt, eum ſic defœcari.

5. Ignis non unitur ita Mercurio, ut clari inter recentiores Chemicos ſcripſerunt.

6. Diligentia vix docet Artificem conſtantem limites, ultra quos pulvis ille amplius non fit.

7. Si pulvis ille oritur igne ex ſulphure crudo Mercurij: hæc deſtillatio non purgat ab eo Mercurium.

VII.

Examinare pulverem, operatione (II, IV, V, VI.) productum.

OPERATIO.

Uncias duas, drachmam, & grana quinquaginta & unum, pulveris illius indidi in retortam vitream, mundam, cruſta abductam argillacea arena temperata; urſi per gradus, ut tandem retorta, nudo igne impoſito, canderet fere a luculento igne ſuprapoſito, in furno arenæ, per tres horas continuatas.

EFFECTUS.

Uncia, & drachmæ ſemiſſis, exiit Mercurij puri, revivificati, ex illo pulvere. In fundo retortæ remanſit pulveris fulgide rutili ad drachmas ſeptem cum ſemiſſe. Hæſit quid in collo retortæ, & in vaſe vitreo ad collum retortæ applicato. Aliquid forte,

forte, igne tam magno, & diuturno, diſſipatum fuit.

COROLLARIA.

1. Redit Mercurius de pulvere, in quem igne verſus fuerat.

2. Revivificatus omnes priſtinas proprietates recipit, acquiſitas deponit. Ex pulvere Mercurius idem.

3. Fixitas acquiſita non fert magnum ignem.

4. Tamen in illo pulvere una pars altera fixior: hæc manet adhuc pulvis, illa redit in Mercurium.

VIII.

Examinare ultra pulverem ſuperſtitem ab operatione præcedenti. (VII.)

OPERATIO.

Drachmas ſeptem, & grana xxxvij, illius pulveris ex retorta puriſſima, vitrea, lorica ex argilla & ſabulo inveſtita, commiſi igni nudo, prudenter, per gradus aucto; donec tandem retortula, infra, & ſupra, igne obruta canderet penitus. Sic ignitam detinui per horas quatuor.

EFFECTUS.

In excipulo Mercurius revivificatus de hoc pulvere puriſſimus ad integras drachmas ſeptem. In fundo retortæ

retortæ grana quindecim pulveris fuſci, ſubtilis, fixi in tanto, tamque diuturno igne. Erat macula lata, tenuiſſima, coloris pulcherrimi rubri, fundo retortæ impreſſa, atque in vitrum quaſi ſe penetrans.

COROLLARIA.

1. Mercurius ſolo igne vertitur in pulverem, jam ante deſcriptum. (II, IV, V, VI, VII, VIII.)

2. Pulvis hic ſolo igne, ſed majore, vertitur in Mercurium.

3. Ita ſerpens ſemet momordit, moritur.

4. Rurſum reſurgit a morte glorioſior.

5. Tanto labore, tanto igne, tamdiu ſuſtentato, ex unciis xvij Mercurij tantum grana xv remanſere fixa, in vitro adeo fervente, ut fere funderetur.

6. Argentum, aurum, alia metalla, ex Mercurio quæſita hac arte, pro ſumtu, & labore, vix ulla.

7. Pulveris fixati ſic ex Mercurio ſeptuageſima ſecunda pars tantum fixa manet hoc in igne, reliquæ redeunt in Mercurium.

8. Grana xxij perdita. An diſperſa? An id pondus, ab igne accretum Mercurio, majore igne inde rurſum ſeparatur?

9. Natura Mercurij conſtans, ſimplex, in diſſimilia ſeparari nequit deſtillando. Nec in fixum, & volatile. Nec in purum & impurum. Nec in fœcem, & defœcatum. Nec in elementa diverſa.

IX.

Grana tredecim pulveris hujus ultimi (VIII.) fixi, impoſui catino, Crucibulo dicto, igni impoſui aperto, ante

ante follem. Intendi vim ignis folle eo uſque, ut totum crucibulum penitus igniretur. Sic detinui per quadrantem horæ. Pulvis manſit in fundo fixus, ſed Spongiæ inſtar tumefactus, fuſcus: Didici hinc fixitatem inſignem ſatis acquiſitam huic pulveri per ſolum ignem.

X.

Tum pulveri huic, tam fixo, (IX.) addidi aliquid boracis, in crucibulo, urſi ignem folle. Facta fuit maſſa una friabilis, vitreſcens, in magno hoc igne fixa.

XI.

Duo grana pulveris ejus, qui adeo fixus manſerat (VIII.) ad pondus xv granorum, dedi Docimaſtæ jurato, peritiſſimo, Amſtelædamenſi, ut examinaret quam accuratiſſime ad leges artis, cum plumbo. Manſit nihil omnino fixi ſuperſtes. Ergo in illo pulvere nihil omnino auri, neque argenti.

XII.

Grana illa tredecimfuſa cum borace in maſſam vitreſcentem (X.) una cum borace, dedi Docimaſtæ jurato, peritiſſimo, Amſtelædamenſi: ut totam hanc maſſulam ſimul examinaret quam accuratiſſime, juxta leges artis in plumbo. Manſit de tota maſſula nihil omnino fixi. Adeoque nihil auri, argenti nihil.

COROLLARIA.

1. Argentum vivum perſtat in igne retinens naturam ſuam immutabilem.

2. Simplex; nec in diverſa ſeparabile per deſtillationem.

3. Fixatur ab igne, & in forma externa videtur mutatum.

4. Sic apparens, in variis partibus, diverſos gradus fixitatis adquirit.

5. Tamen nulla harum partium fixitatem auri, argentive, acquiſivit ab igne tam magno, & diuturno.

6. Cauſa fixans ignis per vitrum tranſeuns, partem Mercurij ſic mutans, ſive actione ſimplici, ſive adunatione ſui cum argento vivo.

7. Ignis ille, ita agens, per DXI deſtillationes, ſua vi, vel conjunctione, nondum potuit vel minimum ejus particulam vertere in aurum, argentumve.

8. Sed ex Mercurio, ſic per ignem fixato, ignis major verum Mercurium reddit; aut plumbi nota vis facit a cupella evaneſcere.

9. Non patet ergo, per hæc experimenta, ex Mercurio, & igne, ſic conſpirantibus, naſci ullum metallum notum: grana illa tredecim ad ignem follium non fluebant; in plumbo non ſtabant; cum Mercurio non ſolvebantur in Amalgama.

10. Ignis igitur, ex his experimentis, non demonſtratur Philoſophorum Sulphur fixans Mercurium in metalla.

11. Sed probabile videtur, Sophorum Sulphur proximum eſſe aliud quid.

12. Pars

12. Pars fixata non eſt fœx Mercurij; nec ejus Sulphur crudum, fœtens: redit in illum.

13. Depuratio Mercurij a fœce terreſtri, & aquoſo crudo, vix videtur ſola deſtillatione obtineri poſſe tam facile: alia forte ſecretiore opera obtinetur.

14. Aurum, vel argentum, ex Mercurio conficere, per ignem, non procedit. Ignari, & imaginationi devoti, faciles promiſſis, divites ſpe. Mercurius hic manſit Mercurius.

15. Tuti a fallacibus ſcriptis, & præſcriptis, Sophiſtarum, qui ex Mercurio, & igne talia promittunt intra breve tempus, paucoſve menſes: ſane intra plures annos ne inchoamenti quidem primi vel minima indicia.

XIII.

Mercurius ſub aqua ebulliente detentus, non elevatur a fundo vaſis.

OPERATIO.

Mercurij puri, bis deſtillati, drachmam infudi in ampullam vitream, uroſcopicam, quam implevi aqua pluvia. Vas tunc impoſui igni nudo. Ebulliit aqua valide per octo horas. Ita tamen, ut ſemper adhuc aliquid aquæ nataret ſupra Mercurium. Ponderatus dein Mercurius dedit drachmam, abſque ulla jactura.

Rurſum drachmam Mercurij infudi in vas vitreum, purum, ſiccum. Id accommodavi intra ahenum, ut non poſſet vacillare. Ahenum replevi aqua. Curavi, aqua ebulliret per octo horas. Vas hoc erat

Cylindricum, apertum, altum duos pollices, & dimidium, & ſic poſitum, ut aqua in id non poſſet ingredi. His ita actis, ponderabat Mercurius drachmam, ſine ulla jactura.

Mercurium purum indidi cucurbitæ vitreæ; ſuper-affudi aquam; impoſito alambico, coxi diu; nihil Mercurij adſcendit. Continuavi decoquere, donec omni aqua expulſa, Mercurius in fundo vaſis ſiccus, non tamen tunc aucto igne. Mercurius ilico adſcendit ad latera cucurbitæ, & in capitellum: ratio patet ex iis, quæ in inſtitutionibus Chemicis ſcripſi, de aqua, & igne.

XIV.

Mercurius arte mutari poteſt, ut adſcendat ex fundo vaſis calore aceti nondum ebullientis.

OPERATIO.

Ex plumbi ſelibra, Mercurij ſeſquilibra, factam maſſam (amalgama) concuſſi in vitro. Naſcebatur pulvis nigerrimus. Hunc immiſi cucurbitæ vitreæ, xiv pollices altæ, ſuperaffudi acetum ſtillatitium vini, geminata deſtillatione puriſſimum. Abſtuli leni deſtillatione phlegma. Auxi dein ignem parum. Sic tamen, ut nullo modo ebulliret liquor. Adſcendit Mercurius in capitellum, una cum phlegmate, & inde in excipulum. Idem aliis modis expertus ſum. Res ſpeculatione digna, Chemici! De qua jam plura non moneo. Artificio ſatis ſimili vidi argentum vivum adeo redditum volatile, ut elevaretur in furno meo digeſtorio per calorem minorem, quam eſt ſani homi-

hominis, adſcendens juxta latera vaſis. An putas, tum fuiſſe purius? Erat miſtum metallo, & ficciſſimum. Sed laborioſiſſima experimenta, quæ per annos inſtitui, tractando Mercurium, & metalla, alio forte memorabo tempore, modo intelligam, talia haud diſplicere Bonis.

XV.

Scripſit Geber, Mercurium purum auro ponderoſiorem. Dudum conatus fui diſcere an cogi queat in denſius, & proinde ponderoſius, quam a natura habetur? Incepi id molire per ſeparationem partis levioris, mutabilioriſque, a reſiduo ponderoſiori, nec potui. Contendebam poſtea variis modis illum defœcare: non ſucceſſit. Attamen quædam reperi digna contemplatione elegantis ſpectatoris. Licetne recitare? hæc ſunt. Auri puriſſimi maſſam duarum Unciarum examinando hydroſtatice in aqua pluvia, leni deſtillatione defœcata, inveni habere pondus ad aquam, ut 19 $\frac{112}{500}$ ad 1. Mercurius venalis, ſemel deſtillatus ex retorta, ad eandem aquam, ut 13 $\frac{57}{100}$ ad 1. Mercurius cum auro puriſſimo ſubactus, aliquot centenis vicibus inde deſtillatus, erat ad aquam, ut 13 $\frac{55}{100}$ ad 1. Mercurius ſic tractatus cum argento puriſſimo, erat ad aquam, ut 13 $\frac{58}{100}$ ad 1. Mercurius plumbo unitus, cum eo verſus in pulverem totus, inde igne magno reſuſcitatus, erat ad aquam ut 13 $\frac{55}{100}$ ad 1. Mercurius DXI vicibus deſtillatus, erat ad aquam ut 14 $\frac{11}{100}$ ad 1. Fuerunt hæ expenſiones ſtaticæ factæ per inſtrumenta irreprehenſa, prudentiſſima ſollicitudine. Annos impendi: quo pararem Mercurium ad hoc propoſitum. Neque, quod ſciam, alius quis eo reſpexit.

ſpexit. Plura inde, meditationi oportuna, ab idoneis hac in materie judicibus erui poterunt. Pauca notare, mihi fas eſto.

COROLLARIA.

1. Si Mercurius defœcatus levior fit: tum defœcatiſſimus redditur per aurum, & plumbum. Arte Suchtenij, & Philalethæ, manet idem.

2. Si Mercurius defœcatus gravior fit: tum defœcatiſſimus redditur per argentum, ratione aliorum metallorum. Sed omnium maxime deſtillatione ſimplici, converſione in præcipitatum rubrum per ſe, & reſuſcitatione inde facta.

3. Poteſt Mercurius reddi denſior per argentum & ignem.

4. Poteſt Mercurius reddi denſior per ignem deſtillando, quam maxime. An ergo hæc via optima ad eum depurandum, & perficiendum?

5. An Mercurius deponit graviſſimam partem ſui in auro? an hæc depoſita eſt ſemen auri?

6. An Mercurius deponit graviſſimam partem ſui in plumbo? an hæc depoſita eſt ſemen auri?

7. An ignis, DXI vicibus coquens, figens, reſuſcitans, Mercurium, auget eam graviſſimam partem? Quouſque id poterit fieri? An Mercurius, opere continuato, tandem poſſet denſari in pondus auri? An tum eſſet aurum vivum, vel Mercurius Philoſophorum? Examinent judices idonei.

Pauca quidem hæc, neque tamen nata ſine labore, & cautela, de purificatione argenti vivi ſufficiant hoc tempore. Longe operoſiora habeo de eductione ejuſ-

dem

Fig. 2.

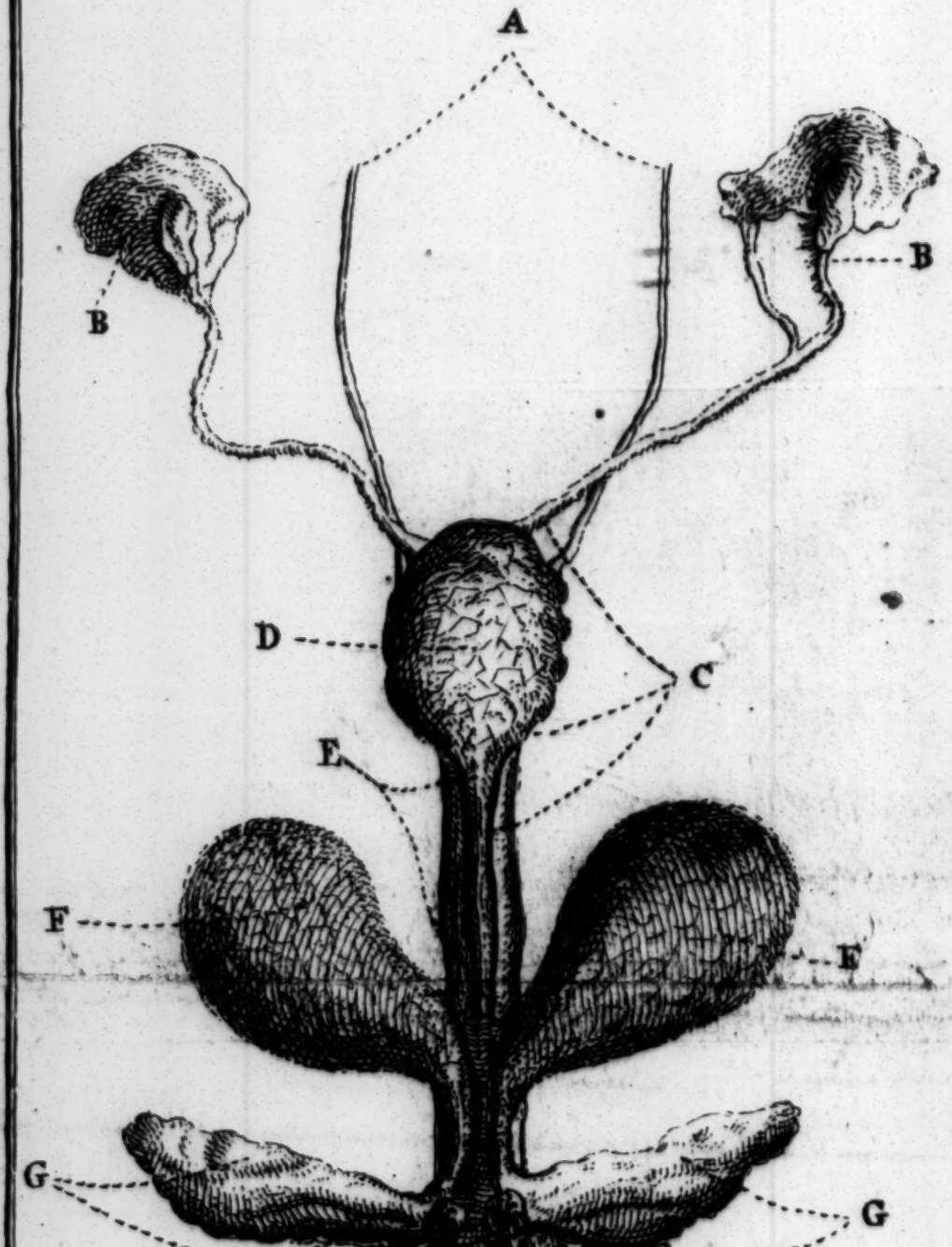
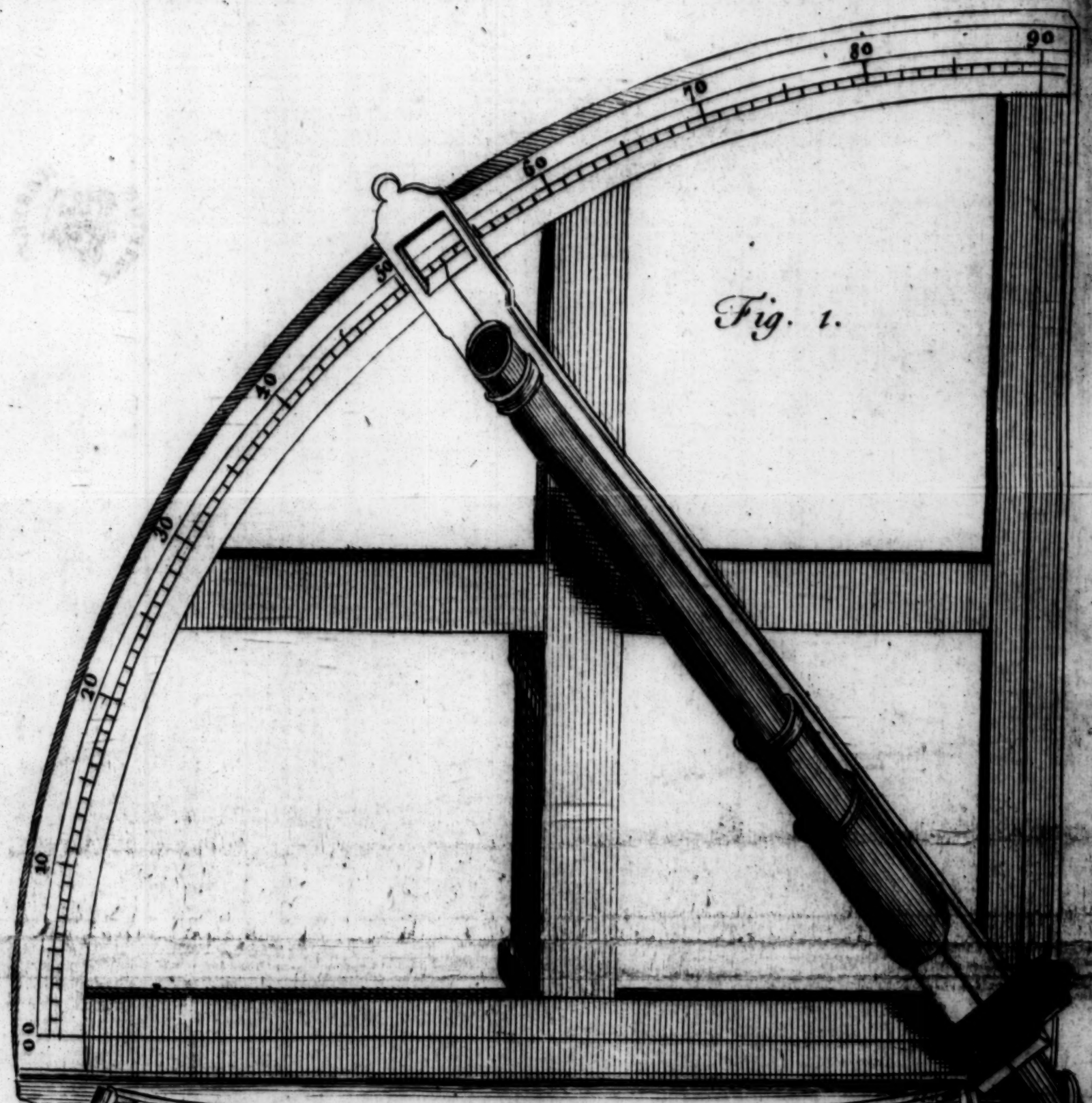


Fig. 1.



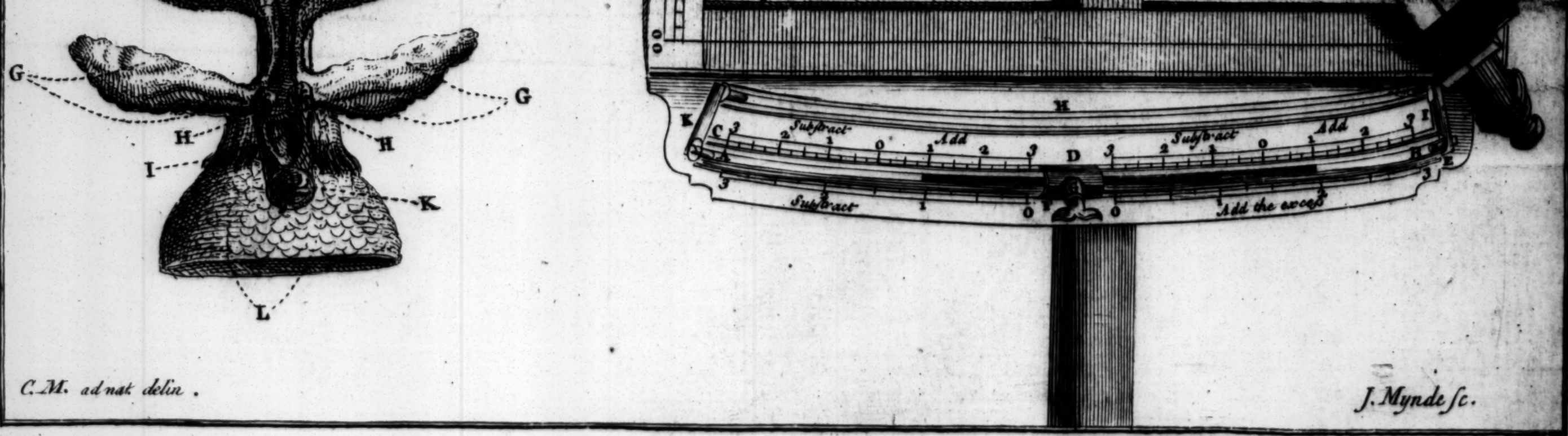
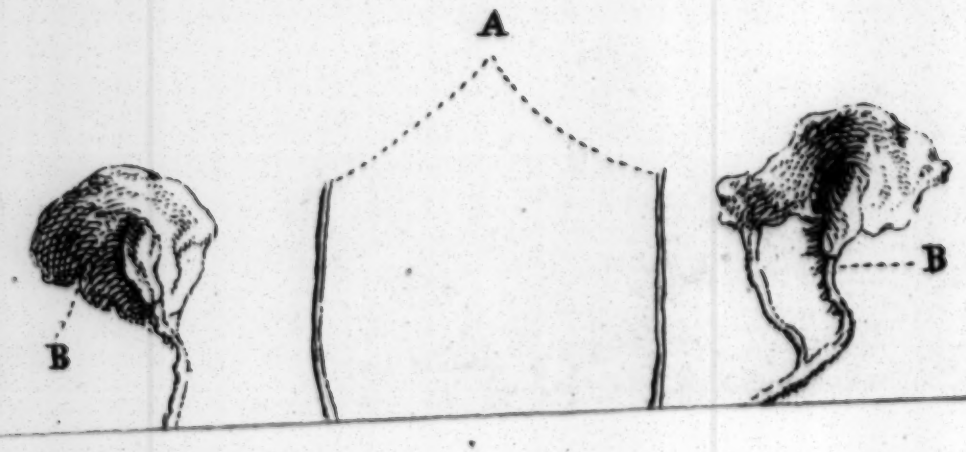

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J. Mynde sc.

Fig. 2.



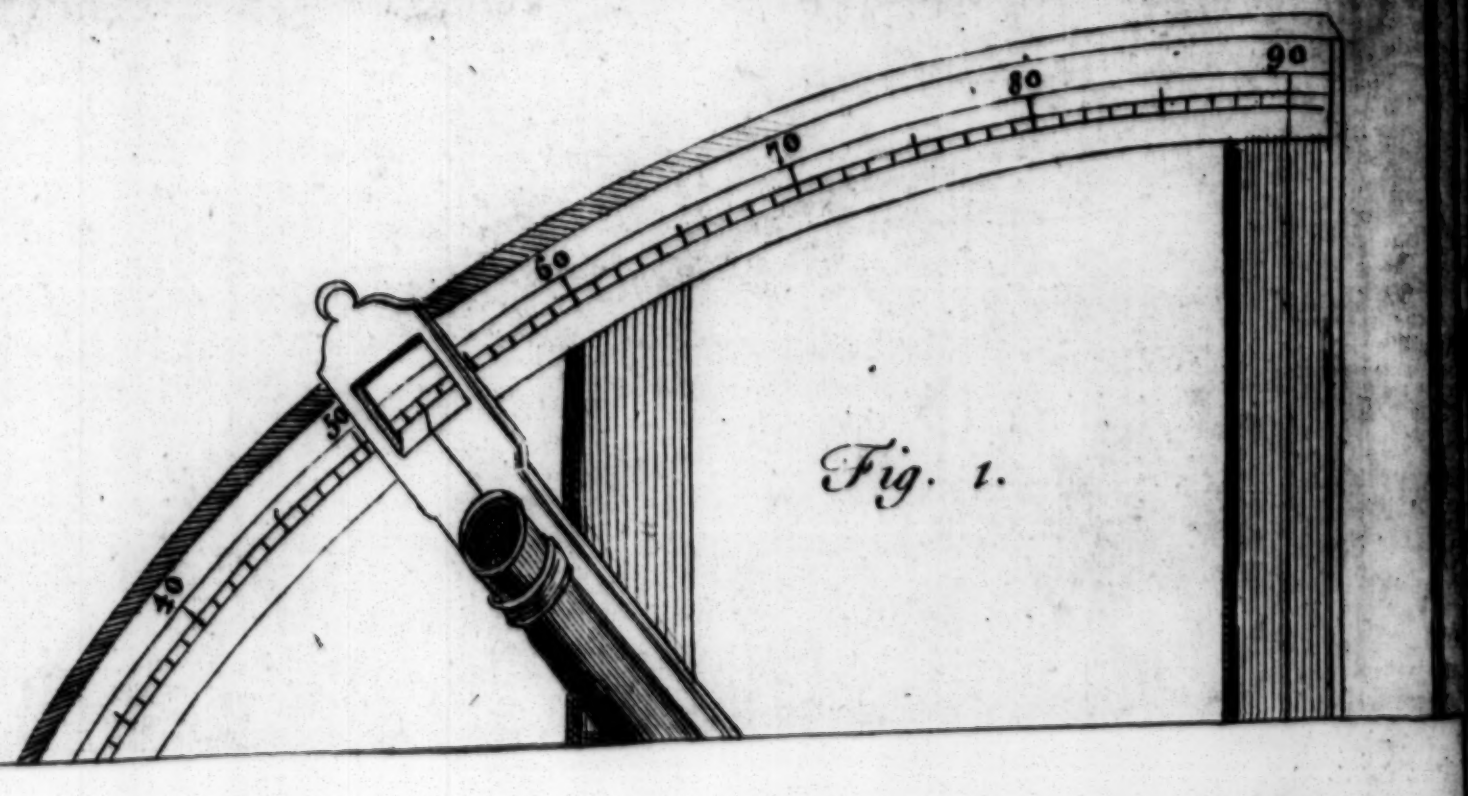


Fig. 1.

dem ex metallis; de actione ejus in metalla; de metallis ipsis; quæ in adversaria redegi. Otium nactus forte evulgabo: ut moniti parcant vano labori, & sumtibus. Valete!

II. *A* Spirit Level *to be fixed to a* Quadrant *for taking a Meridional Altitude at* Sea, *when the* Horizon *is not visible.* *By* John Hadley, *Esq; V. Pr. R. S.*

THE Necessity of seeing the Horizon, in order to find the Latitude of a Ship at Sea, has always been so great an Inconvenience, that any Method for determining it without the Help of the Horizon, will be of considerable Use, although it should be liable to an Error of a few Minutes: And as it is generally agreed by Seamen, that they are much oftner sensible of this Inconvenience in calm Weather, than in rough; it is hoped that the following manner of constructing and using a Spirit Level, may, in that Case, be capable of so much Exactness, at least, as may render it acceptable to the Publick. *Vide Fig.* 1.

This Level is composed of a Glass Tube A B, bent into an Arch of a Circle, and containing such Number of Degrees as will be most suitable to the Degree of Exactness with which the Observation can be made. The Bore of it must not be wider than one Tenth of an Inch in Diameter, that the Liquor

in it may the better keep together, and the two Ends of it ſtand Perpendicular to the Tube in all Poſtures: Nor ſhould it be much leſs, leaſt the hanging of the Spirit to the Sides hinder it from ſettling ſo truly by its Weight to the loweſt Part of the Tube. This Tube is cemented into another Braſs one C D E F, of the ſame Curvature, the outer Half of which is taken off, ſo as to ſhew the Glaſs, leaving only a ſmall Part in the Middle D F entire, in which a ſmall Stop-cock G is placed. The Glaſs Tube is divided in two in the Middle to make room for this Stop-cock, the Key of which muſt be pierced through with a Hole of only about one hundredth Part of an Inch, for the Paſſage of the Liquor. The outer Ends of the Glaſs Tube muſt have a Communication with one another round about by Means of two ſmall Pipes I and K, and the Tube H, the manner of which is ſufficiently ſhewn by the Figure.

Each half of the Glaſs Tube A B muſt have a Scale of Degrees anſwering the Curvature of the Tube, ſubdivided at Pleaſure. They may be numb'er'd either as the upper or under Scale in the Figure; and obſerve that in the under Scale two Degrees are number'd as one; the Reaſon of which is, that the Motion of the Spirit in the Tube encreaſing the Number on one Hand, and at the ſame time as much diminiſhing that on the other, their Difference is alter'd thereby, ſo as to anſwer to double that Motion. The Diviſion of the Scales are cut on the Edge of the Braſs half Tube, or Trough, which is made thick for the greater Strength.

In one of the ſmall Pipes I or K, juſt againſt the Return of it, which enters the End of the firſt-mentioned Glaſs Tube at A or B, is a ſmall Hole, by which to introduce into it ſo much Spirit of Wine as may fill it from the Middle of the Scale on one Hand to the Middle of that on the other; this Hole may be afterwards ſtopped by a Skrew-pin.

The inner Ends of the two Halves of the Glaſs Tube A B ſhould be fixed into the entire Part of the Braſs Tube D F with a Cement made with old hard Bees-Wax, or ſome other Materials not diſſolvable by Spirit of Wine, as ſhould alſo the Ends of the ſmall Pipes I and K into this and the Tube H: Thoſe Halves, as to the remaining Part of their Lengths, may be faſtned down with any ſtrong Cement.

This Level may be ſet on to one of the Limbs of the Quadrant, fitted up for this Purpoſe, in the manner expreſs'd in the Figure. It hath an Index moveable on the Center, and a Spring at the other End to keep it ſteady, when it is directed to any of the Diviſions on the Arch, which needs no other Diviſion than into whole Degrees. The Index may be furniſhed either with plain Sights, or may carry a ſhort Teleſcope, with a Vane in its Focus, to receive the Image of the Sun, when it is bright enough; but if the Sun be hazy, or the Moon, or a Star be obſerved, a ſliding Shutter may be drawn out to tranſmit the Rays of Light to the Eye-glaſs. The Vane has alſo a Thread fix'd on it perpendicular to the Plane of the Quadrant. The whole Inſtrument (for the eaſier managing it) may be ſupported by a Staff, reſting with one End on the Floor.

The manner of uſing it is thus: Holding the Quadrant in a vertical Poſture, with that Limb to which the Level is fixed parallel to the Horizon, raiſe the Index to ſome Diviſion of the Arch, as near as you can to the true Height of the Object; which is ſuppoſed to be near the Meridian, and conſequently to alter its Altitude but ſlowly: Then turning the Key of the Stop-cock, ſo as to let the Spirit of Wine paſs through the ſmall Hole in it, keep the Image of the Object as cloſe to the Thread on the Vane as you can, endeavouring that the unavoidable Vibrations of it above and below the Thread, may be equal, both in reſpect of their Length, and the Swiftneſs of their Motions, *&c.* Continue this 'till the Spirit ſeems quite ſettled to ſome Part of the Scale, and ſomething longer. This it will do ſlowly, but without any ſenſible Vibrations; for the Stop-cock allowing it no Paſſage but through the ſmall Hole in its Key, will give ſuch a Check to its Motions, as not only to ſtop thoſe Vibrations, but alſo to hinder its being thrown backwards and forwards in the Tube by any Shocks of the Inſtrument; and yet as far as I have obſerved will not prevent its ſettling (with ſufficient Truth, though ſlowly) to the loweſt Part of the Tube. About half a Minute of Time or more may be neceſſary for this, according as the aforeſaid ſmall Hole is greater, or leſs in Proportion to the Bore of the Tube. When you judge the Spirit quite ſettled, turn the Stop-cock again: It is of no Importance that the Image of the Object be exactly on the Thread at the Inſtant that this is done. Obſerve againſt what Degree, and Part of a Degree, each End of the Spirit in the Tube ſtands. If your Scale be number'd like the upper one in the Figure, and the Quantity of Spirit be exact, both

Ends

Ends will agree, and the Degree and Parts marked muſt be added to, or ſubſtracted from the Altitude ſhewn by the Index, according to the Directions: If the Ends do not exactly agree, take the Mean between them. If you uſe the under Scale, ſubſtract the leſs Number from the greater, and add, or ſubſtract the Exceſs, the Number reſulting will ſhew the mean Elevation of the Index during the latter Part of the Obſervation, and will differ from the true Altitude of the Object about half ſo much as the Vibrations of its Image above and below the aforementioned Thread on the Vane fail of compenſating one another during that time. If either End of the Spirit leave the Scale, the Index muſt be remov'd three or four Degrees, and the Obſervation repeated.

Inſtead of the Curve Tubes A and B, two ſtrait ones might be uſed, ſet together ſo as to make a very obtuſe Angle in the Middle; but then it will be convenient to have the Quantity of Spirit more exactly fitted to the Scale, becauſe the allowing for the Difference will be ſomething more troubleſome.

If the Obſerver have an Aſſiſtant to attend to the Level, while he himſelf obſerves the Object, the whole Apparatus of the Braſs Tube, and Stop-cock, may be omitted, ſubſtituting in its room only a Plug with a ſmall Hole in it, which may be wrapped round with a very thin Slice of Cork, and ſo thruſt down into the middle of the Glaſs Tube. The cutting the Glaſs Tube in half in the Middle may likewiſe be avoided, if, inſtead of the Stop-cock at G, there be one fixed in one or both of the Pipes I and K, to open and ſtop the Paſſage of the Air, having a larger Hole in their Keys, there being alſo a Plug with a ſmall Hole, thruſt down into the Middle of the Tube, as before.

I

The Bore of the ſmall Pipes I and K, and the Tube H, muſt not be ſo narrow as to make it difficult to reduce the Spirit into its Place, if by any Accident either End of it ſhould get into them.

I have been informed, that an Object may be kept in View without much Difficulty, even in pretty rough Weather, thro' a Teleſcope magnifying about ten times. Now as ſuch Teleſcopes ſeldom comprehend an Area of much more than one Degree in Diameter, or at moſt 1 Deg. 20 Min. it follows that the Axis of the Teleſcope is always kept within 40 Min. at moſt of the Object, and that is the greateſt Vibration of the Image above and below the Thread on the Vane. If this be allowed, it ſeems reaſonable to expect that the Medium of the Vibrations one Way ſhould not exceed the Medium of thoſe the other, more than by about one fifth or one ſixth Part of the greateſt Vibration; *i.e.* about 7 or 8 Min. the half of which will be the Error of the Obſervation. In ſtill Weather it will probably be much leſs, if the Inſtrument be in the Hands of a Perſon moderately ſkilful in obſerving.

III. *The Anatomy of a* Female Beaver, *and an Account of* Caſtor *found in her.* *By* C. Mortimer, *M. D. R. S. Secret.*

IN the *Acta Erudit. Menſe Aug.* 1684, *pag.* 360, *& ſeq.* I find the Account of the Diſſection of a Male and Female *Beaver* by *E. G. H.* who miſtakes, in opening the Male, the Receptacles of the *Caſtor* for the *Uterus*, and the two *Glands* below them for *Dugs*;

Dugs; and as they found a *Penis* and *Teſticles* in the ſame Animal, they were ready to conclude it to be an *Hermophrodite*: But on diſſecting the Female, they found a *Uterus*, with two Horns like that of *Bitches*, beſides the Receptacles of the *Caſtor*, which I ſhould have thought ſufficient to have ſet our Anatomiſt to rights, as to the former *Beaver*'s being an *Hermophrodite*.

Johannes Francus, a *German* Phyſician, hath publiſhed a Treatiſe called, *Caſtorologia explicans Caſtoris animalis naturam & uſum Medico-chemicum, Auguſt. Vindel.* 1685, 8*vo*. being a Commentary on a Treatiſe formerly wrote by one *Johan. Marius*, a Phyſician at *Ulm*.

Marius, in *Sect.* VII, deſcribes the Receptacles of the *Caſtor*, as being Bags near as big as a Gooſe-Egg; and that they have been wrongly called the *Teſticles*, being in Females as well as Males, but that they have no Communication with the *Pudenda*. His Commentator *Francus* recites the Opinions of ſome modern Writers, who are ſtill in the old Error as ancient as *Ælian*, who ſays, that the *Beaver* bites out his own *Teſticles*, when purſued by the Hunters, as if he were conſcious thoſe were the Parts his Perſecutors want, and ſeek his Life for. He cites *Adam Zwikerus* as having this Notion, and likewiſe *Joh. Harderus* and *Joh. Schapplerus*; nay, ſome have thought ſo abſurdly, as to imagine that the *Beaver* had four *Teſticles*: And he ſays, that *Gulielmus Rondeletius* was the firſt Perſon who diſſected a *Beaver* with Accuracy ſufficient to refute the old Error; ſhewing that the *Caſtor* was not the *Teſticles*, but peculiar Bags lying in the Groin.

Marius,

Marius, *Sect.* IX, ſays, that *Beavers* are found in the *Ilera*, and the *Danube*, particularly in a ſmall River near *Leipheim*, called the *Biber*. The Commentator ſaith this River hath its Name from the vaſt Numbers which were formerly found thereabouts, *Biber* being *German* for a *Beaver*, but that now they are all deſtroy'd, and none to be found in the *Danube*, except in *Auſtria*; that there are a few in ſome Rivers in *Swiſſerland*, in *Poland*, in *Muſcovy*, in the *Wolga*, in the *Weſt-Indies*, eſpecially in *Canada*. The greateſt Quantity of *Caſtor*, which is brought to *England*, comes from *Maryland*, *New-England*, and *Hudſon's-Bay*.

In *Sect.* XI, *Marius* tells a Story of a peculiar Vertue in the Fur of the *Beaver*, which he had from a *Jew*, who inform'd him, that by wearing on one's Head a Cap made of the Fur of the *Beaver*, and by anointing the Head once a Month with Oil of *Caſtor*, and taking two or three Ounces of *Caſtor* in a Year, one's Memory will be ſo ſtrengthen'd, as to be able to remember every thing one reads. Though this ſeems to be only a ſuperſtitious Fancy, yet I mention it, becauſe probably ſuch a Notion might have at firſt brought the Uſe of the Flock of this Animal into Requeſt for making Hats.

In the Memoirs of the Academy of *Sciences* at *Paris*, for the Year 1704, *pag.* 48, *& ſeq.* is an Extract of a Letter from M. *Sarraſin*, the King's Phyſician in *Canada*, concerning the Anatomy of the *Beaver*, dated *Octob.* 25, 1700, at *Quebec*. He ſays, the largeſt are three or four Feet long, and about a Foot or fifteen Inches broad in the Cheſt, and in the Hanches; that they commonly weigh

about

about fifty Pounds; that they uſually live to the Age of twenty Years; but *Francus, ad Sect.* VIII, ſays, they live thirty or forty Years, and that he heard of a tame one being kept ſeventy-eight Years: Perhaps the *European* may generally be longer liv'd than the *American.* Dr. *Sarraſin* ſays farther, that a great Way North theſe Animals are very black, though there are ſome white ones to be ſeen; thoſe in *Canada* are commonly brown, but their Colour grows lighter, as they are found in more temperate Countries; for they are yellow, and even almoſt of a Straw-colour in the Country of the *Ilinois* and *Chaouanons.* Our Author then gives a very particular Account of the ſeveral Parts External and Internal of this Animal: He takes eſpecial Notice of the Stomach, which, he ſays, is above a Foot long, and about four Inches broad in the Part next to the Spleen; that at about two Thirds of its Length, it is contracted to half its former Capacity for an Inch in Length; that then it widens again to three Inches towards the *Pylorus*, which is raiſed very high, is round, and drawn towards the *Spleen* by a Membrane which adheres to the *Æſophagus* by its other End. Tho' this Dilatation ſeems to make a ſecond Stomach, it only ſerves to retain the Aliments a longer time, eſpecially the more ſolid, as the Wood, which only undergoes a ſlight Extraction, paſſing through with very little Alteration, whereas Herbs, Fruits and Roots are perfectly diſſolved. The Membranes of the Stomach are very thin, ſo that this ſecond Part will ſcarce bear being diſtended with Wind.

In

In a *Beaver* full grown the *Cæcum*, which is in Form of a Sickle, is eighteen Inches long on the hollow Side, and thirty Inches on the round Side, and four Inches broad at the larger End, and will contain between five and ſix Pints of Water.

When he deſcribes the Receptacles of the *Caſtor*, he ſays, that the uppermoſt Bags contain a ſoft reſinous Matter, but that the lower ones are filled with an oily Matter; the greateſt Bags weigh but two Ounces.

Dr. *Sarraſin* ſays, that he was never able to diſcover what uſe this *Caſtor* was of to the *Beavers* themſelves, being well aſſured that they do not themſelves ſwallow it to excite their own Appetite. It is likewiſe falſe, that the Hunters uſe it as a Bait to draw the *Beavers* into their Toils, though they do uſe it to entice thoſe Animals which infeſt the *Beavers*, as Martins, Foxes, Bears, *&c.*

Our Author having finiſhed the Anatomical Deſcription of this Animal, ſubjoins ſeveral things regarding their manner of living; as that they chooſe a low level Ground water'd with a ſmall Rivulet, that it may be eaſily overflowed, which they do by making Damms a-croſs it: They make theſe Damms by thruſting down Stakes of five or ſix Feet long, and as thick as one's Arm, pretty deep into the Ground; theſe they will wattle a-croſs with tender pliable Boughs, and fill up the Spaces with Clay, making a Slope on the Side againſt which the Water preſſes, but leaving the other perpendicular. They make their Houſes after the ſame manner; the Walls are upright, two Foot thick, and at Top in Form of a Dome; they are uſually oval, five or ſix Feet long

long on the Inſide and near as broad, being ſufficient to lodge eight or ten *Beavers*, and two or three Stories high, which they inhabit as the Water riſes or falls.

Sometimes they build ſeveral Houſes near together, which communicate with one another. He ſays there are ſome *Beavers* called *Terriers*, which burrow in the Earth: They begin their Hole at ſuch a Depth under Water as they know that the Water will not freeze ſo deep; this they carry on for five or ſix Feet, and but juſt large enough for them to creep through; then they make a Bathing-Place three or four Feet every Way; from whence they continue the Burrow, always aſcending by Stories, that they may lodge dry as the Waters riſe: Some of theſe Burrows have been found to be an hundred Feet long. They cover the Places where they lie with Weeds; and in Winter they make Chips of Wood, which ſerve them for Matelas's: They live on Herbs, Fruits, and Roots in Summer, but againſt Winter they lay up a Proviſion of Wood, a Stack of twenty-five or thirty Feet Square, and eight or ten high, is the uſual Quantity for eight or ten *Beavers:* They only eat thoſe Pieces which are ſoak'd in the Water. The above-cited *Marius* ſays, they only live on ſuch Vegetable Food; but his Commentator *Francus* ſays, *ad Sect.* IV, that they prey upon Fiſh, Cray-fiſh, and Frogs likewiſe, as do *Otters:* And that they make Burrows in the Banks of the Rivers, opening under the Water.

In the *Memoires pour ſervir à l'Hiſtoire Naturelle des Animaux*, compoſed by Order of *Louis* XIV, printed at *Paris* 1671, in *Folio*, at

pag. 64, *& ſeq.* I find an Anatomical Deſcription of a *Beaver*, with a Plate, in which are repreſented ſome of the moſt remarkable Parts, as the Brain, the Fore-foot, the *Inteſtinum Cæcum*, and the Parts of Generation of a Male *Beaver*, with the Receptacles of the *Caſtor* delineated in their natural Situation, *pag.* 69. Our Author ſays, that the real Teſticles reſemble thoſe of Dogs; that they lie cloſe to the *Os Pubis*, on the outward Part of the Sides, and that they are not at all diſcernible thro' the Skin. The *Penis* had a ſharp-pointed Bone, in its Extremity, like that of a Dog; but inſtead of lying with its Point towards the Navel of the Creature, it lay with it towards the Tail, and was ſo deep buried in the *Fiſſure*, which ſerves in common for the *Anus*, for the *Penis*, and the *Excretory Ducts* of the *Caſtor*, that they could not diſtinguiſh what Sex the *Beaver* was of, 'till the Skin was taken off.

Our Author ſays, that in opening the *Inteſtines* they found in them eight large Worms reſembling common Earth-Worms, three of which were ſeven or eight Inches long, the reſt only four.

In the Heart were the plain Footſteps of the *Foramen Ovale*.

A little below the *Coronary-Vein*, he mentions a *Valve*, which he ſays is called *Valvula nobilis*, and cloſes the whole *Vena Cava*, but opens ſo that the Blood can flow readily from the *Liver* towards the *Heart*, and not from the *Heart* back again towards the *Liver*.

This Author ſays, that the *Brain* was but one Inch two thirds long, and one and a half broad, which was very ſmall in Proportion to the Size of the Crea-

Creature; and ſtill more ſo in Proportion to the Sagacity with which it is ſaid he is endowed.

Theſe are the moſt remarkable Particulars I met with in reading over the above-mentioned Books. I ſhall now add only ſuch as they have paſs'd over, or what eſpecially regard the Sex of this Female *Beaver*.

This Creature was kept at the Honourable Sir *Hans Sloane*'s, in his Garden, for about three Months. She was but about half grown, not being above 22 Inches long from the Noſe to the Root of the Tail; the Tail 8 Inches long. She was very thick, paunch-bellied; the Shape of the Head, and indeed of the whole Animal, except the Tail, and Hind-feet, very much reſembled a great over-grown Water-Rat.

Her Food was Bread and Water; ſome Willow-Boughs were given her, of which ſhe eat but little; but when ſhe was looſe in the Garden, ſhe ſeem'd to like the Vines much, having gnawn ſeveral of them as high as ſhe could reach quite down to the Roots: She gnawed the Jeſſamy likewiſe, but leaſt of all ſome Holly Trees. I am told that in *Carolina* they particularly love the *Saſſafras*, and will cut down Trees of between 2 and 3 Feet Diameter. She was turned into a Fountain with ſome live Flounders, but never offer'd to ſtrike at them, as an *Otter* would have done. When ſhe eat, ſhe always ſate on her hind Legs, and held the Bread in her Paws like a Squirrel. When ſhe ſlept ſhe commonly lay upon her Belly, with her Tail under her. In ſwimming ſhe held her Fore-feet cloſe up under her Throat, and the Claws cloſed, as when one brings the Ends of one's Thumb and of all the Fingers cloſe together, never moving her Fore-feet 'till ſhe came to the Side, and endeavour'd to get out. She ſwam with her Hind-feet only, which

had five Toes, and were webbed like thoſe of a Gooſe; the Tail, which was ſcaly, and in Form of the Blade of an Oar, ſerved as a Rudder, with which ſhe ſteer'd herſelf, eſpecially when ſhe ſwam under Water, which ſhe would do for two or three Minutes, and then come up to vent, ſometimes raiſing her Noſtrils only above Water: She ſwam much ſwifter than any Water-Fowl, moving under Water as ſwift, I believe, as a Carp. The Hind-Legs being much longer than the Fore, made her walk but ſlowly, or rather waddle like a Duck when on dry Land; and if drove along faſt, ſhe could not run, but went by Jumps, flapping her Tail againſt the Ground. Her Excrements were always black and extraordinary fetid; her Urine turbid and whitiſh, and very ſtrong ſcented. I never heard her make any Noiſe, except a little ſort of a grunting, when driven faſt and angred. She ſeemed very briſk, and thrived well with the above-mentioned Food, being turned into the Fountain to bath three or four times a Week; but the Author of the *Memoires de l'Hiſtoire des Animaux*, above-cited, ſays, that the Male *Beaver* they diſſected, had lived ſeveral Years at *Verſailles* without being permitted to go into the Water. Our *Beaver* had one Day Convulſion Fits, very like the Epilepſy in Men, from which ſhe recovered ſoon, and was very well after them, 'till at laſt ſhe was kill'd by a Dog; when ſhe was ſo torn, that we could ſee nothing Particular in the *Heart*, or in the *Lungs*. In the *Abdomen* the *Liver* and *Kidnies* were quite torn a-pieces. There were ſeveral Holes bit through the Stomach, out of one of which crawled a Worm about ſix or ſeven Inches long, like a common Earth-Worm,

Worm, being probably of the ſame Sort as thoſe mentioned before by the Author of the *Memoires*, *&c.* The Bowels in general ſeemed very much to reſemble thoſe of Dogs, except the *Inteſtinum Cæcum*, which was of that prodigious Size as is above-mention'd. This Creature being a Female, we found the *Ovaria* and the *Uterus* divided into two Horns, in the ſame Situation as in Bitches: The Bladder was contracted about the Size of a Walnut, very much wrinkled on the outſide; it lay exactly over the Body of the *Uterus*; the *Meatus Urinarius* ran upon the *Vagina* above two Inches in Length. Juſt below the *Os Pubis*, on each Side of the *Vagina*, and above the *Meatus Urinarius* (ſuppoſing the Animal to lie on her Back, as when we opened her) we found a Pair of Bags in Form of Pears, about an Inch and three quarters long, and one Inch broad, diverging at their Bottoms, or broad Ends, but join'd almoſt cloſe together at their Necks, or narrow Ends, which were Canals communicating with the adjoining *Glands*. The *Membranes* which form'd theſe Bags were very tough, full of Wrinkles and Furrows, and of a livid dirty Colour; they were hollow, and able to contain about an Ounce of Water. Upon opening one of them, we found a ſmall Quantity of a dark brown Liquor like Tar, of the Conſiſtence of a thick Syrup, which ſmelt exactly like *Caſtor*, and had a Sort of Pungency like Spirit of Hart's-horn, which the dried *Caſtor* doth not retain. It is very probable that the Youth of our Animal was the Reaſon why theſe Bags were not full; and that the *Caſtor* itſelf was not of that ſoft reſinous Conſiſtence as mentioned by Dr. *Sarrazin*, *loc. citat.* Theſe muſt be the Bags miſta-

mistaken in the *Act. Eruditor.* for the *Uterus*. About one Inch lower were situated a Pair of *Glandular* Bodies, one on each Side the *Vagina*, about an Inch and a half in Length, and half an Inch in Breadth: They were of an oblong irregular Shape, of a pale Flesh-colour, like the *Pancreas*, or other *Glands*, and having several Protuberances outwardly. These *Glands* seem to communicate with the above-described Bags, the Canals coming down from them being implanted into the *Glands*, and both the *Bag* and *Gland* on each Side hath but one Orifice, which is black, beset with long black Hairs, and opens into the lower Part of the *Rima*, or great *Fissure*, into which likewise open the *Vagina* and the *Anus*. From the Structure of these *Glands*, and their Connection with the Bags, I conclude, that the *Castor* is secreted in these *Glands*, where it is fluid like Oil, light-colour'd, and hardly having any Smell; that it runs down into the Bags, which serve as Receptacles to collect a large Quantity together for the Use of the *Beaver*, and that in these Receptacles it loses its thinner Parts, becomes more inspissate, of an higher Colour, and of a stronger Scent, much in the same manner as the *Gall* in the *Gall-Bladder*, which there becomes so different from what it was in the *Liver*.

It is certain that Ducks, Geese, and all sorts of Water-Fowl, have a *Gland* in their Rump, from which they express with their Bill an oily Matter, and with it anoint or dress their Feathers, to prevent their being soak'd by the Water in which they swim; and the *Glands* of that large Sort of Duck commonly called the *Muscovy*-Duck, or more pro-

properly the *Musk-Duck*, afford ſuch an Oil, as ſweet-ſcented as *Civet*: I therefore think it probable, as the *Beaver* is an Animal, which frequents the Water as much as thoſe Water-Fowls, that the *Caſtor* is a Subſtance provided by Nature for him to greeſe and anoint his Fur with, to prevent the Water from ſoaking quite to his Skin: and as the *Caſtor* is impregnated with penetrating pungent Particles, it may likewiſe contribute to keep off the Cold and Chill which the Water might otherwiſe ſtrike to his Body, by remaining a long time in it.

As none of the Authors I have met with have given any Delineation of the Parts of Generation, or of the Receptacles of the *Caſtor* in a Female *Beaver*, I have drawn them after Nature, as they are repreſented in the Figure. *Vide* Fig. 2.

A. The two *Ureters*.
B B. The *Ovaria*.
C. The *Uterus* lying under the *Bladder*.
D. The *Bladder*, contracted and empty of *Urine*.
E. The *Meatus Urinarius*, above two Inches long.
F F. The *Receptacles*, containing the *Caſtor*.
G G. The two *Glandules*, which open by one common Orifice, with the Receptacles, at
H H. The Orifices of the *Caſtor*-Ducts.
I. The *Vagina* cut off.
K. The *Anus*.
L. Part of the *Tail*.

IV. Aëris Terræque Phyſica Hiſtoria, *Anni Biſſ.* 1732. *à* Nicolao Cyrillo *in Univerſitate* Neapolit. *Primar. Med. Profeſſ. & R. S. S.*

I. PLUVIA copioſior Menſe Januario & Decembri cecidit : illo enim ad Menſuras 131, hoc ad 111 aſcendit : Menſe quoque Octobri ad 108, numeratæ ſunt. Menſe verò Martio & Maio parciſſimè pluit. Ita ut comparatis inter ſe Anni tempeſtatibus Hyems & Autumnus magis pluviæ ; Ver atque Æſtas ad ſerenitatem vergentes, ſed maximè Ver. Id quidem noſtris regionibus familiare, atque Aëris temperiei, æſtivo ſiccoque Anni tempori magis conſonum. Ut mirum videri poſſit, quòd in Cœlo Pariſienſi maxima Pluviæ copia Menſibus decidat Julio, Auguſto, & Septembri : quod à Cl. de la Hire conſtantiſſimè eſt animadverſum. Fortaſſe quia is eſt illius Regionis (quæ à Septemtrione & Occidente Oceanum habet) ſitus, Aëriſque indoles, ut in eâ æſtivo tempore frequentiores ſint Tempeſtates illæ, quæ cum copioſis imbribus copulantur ; Nos verò, quos Mare Tyrrhenum ad Auſtrum & Occidentem alluit, atque Apennini ad Septentrionem & Orientem poſiti cingunt, rariores pluvias illas Tempeſtates experiamur. Elevatis enim fervido Æſtatis Sole copioſioribus è Mari vaporibus, poterunt qui ab Oceano ſurgunt, & copioſiſſimi verſùs terram feruntur, in Boreis, ac ferè planis Galliæ regionibus

gionibus copioſiores & frequentiores pluvias tunc temporis creare. In noſtris vero oris minùs copioſi exurgentes è Tyrrheno Mari vapores, minorem æſtivâ tempeſtate pluviæ materiam ſubminiſtrabunt: præſertim quum & illis versùs Terram delatis Montes Apennini, & Venti è mediterraneis Regionibus eo tempore ex oppoſito reflantes facili negotio obſiſtant. Ex hac mutuâ Ventorum è mari atque terrâ in ſe invicem contranitentium pugnâ Tempeſtates æſtivæ apud nos accidere ſolent, *Tropee* linguâ vernaculâ appellatæ, quæ Fulguribus, Tonitruis & Fulminibus notabiles potiùs ſunt, quam Pluviæ copiâ.

II. Nix, quæ circa finem Anni 1731. Montes, & quidem alta occupaverat, Januario, Februario & Martio, 1732, in iiſdem ferè ſemper conſervata fuit, novâ ſupra veterem aſſiduo cadente. Veſuvium ipſum ſæpe nive contectum obſervavimus: in Urbe verò & Suburbano agro haud unquam terræ adhæſit. Gelu ſolis 29, 30 & 31, elapſi Anni diebus concrevit: primâ die mediocre, ſecundâ altius, tertiâ tenuius poſt meridiem ſolutum: Thermometri Haukſbeiani liquore ad gr. 57um ſubſidente, ac primis duobus diebus aëre omninò quieſcente, tertiâ verò flante N. W. Extremo vero Novembri, & primis Decembris diebus hujus Anni Gelu in Urbe concretum primò craſſum deinde tenuius, ut in Diario. Grando 23 Februar. in ſuburbanis locis: 4 Martij etiam in Urbe: 4 & poſt 20 Aprilis in montibus obſervata. At 14 Sept. Foggiæ cum maximo turbine maxima cecidit Grando & animalia & homines in aperto cœlo agentes non leviter feriens.

III. Ventorum varia vis,& ij ſæpè ſibi ipſis oppoſiti, Hyeme ut plurimùm Occidentales, nunc ad meridiem, nunc ad ſeptemtrionem vergentes viguerunt: quod nobis Mare ad eam plagam habentibus familiariſſimum eſſe ſolet. Boreales verò rariùs ſpiravere: primâ tamen & ſecundâ Januarij fortiſſimus N. E. Aërem primò repurgavit, deinde aliquantulùm remittens, atque in N. W. mutatus Nive montes conſperſit.

Hoc loco opportunum reputavi in Machinulam ad Ventorum vim metiendam, N° 24. Tranſactionum Philoſophicarum Regiæ Societatis deſcriptam animadvertere: eam ſcilicet ad talem uſum incertam imò falſam exiſtimari debere. Bracteæ, vel Sagittæ verſatili, quâ in celſis Turribus appoſitâ utimur pro Ventorum Indice, mobilis Pinnula tranſverſa appenditur, ac Circuli Quadrans in gradus diviſus apponitur. Cùm Ventus nullus eſt, Pinnula hæc omninò ad perpendiculum pendet: flante verò Vento elevatur, ac pro vario Venti impetu, vel parùm, vel magis altè aſſurgens, virium gradus in Quadrante deſignat. Id falſum eſſe ex eo liquet: nam minimâ vi Venti Pinnula è ſitu perpendiculari ad decem & plures gradus aſſurgere facilè poteſt: quò magis autem à perpendiculari recedit, eò magis creſcit elevationis Pinnulæ difficultas: ita ut ſi in primâ Pinnulæ elevatione ad percurrendos decem Quadrantis gradus, ſufficiant duo Venti virium gradus; ad alios decem Quadrantis gradus acquirendos vix pares erunt quatuor gradus virium Venti: atque adeò ut Pinnula ad gradum e. g. trigeſimum Quadrantis perveniat, haud ſufficient Venti vires ad ſextum & octavum gradum adauctæ. Unde patet, haud poſſe nos hâc

Machinâ

Machinâ Ventorum vim exactè metiri : haud enim hæ increſcentes proportione reſpondebunt gradibus in Quadrante deſignatis.

Satius igitur erit ad Ventorum vim utcumque dimetiendam eâ methodo uti, quam proponit Cl. Jurinus N° 379, earundem Tranſactionum, quâque nos in noſtris Obſervationibus uſi ſumus. Ea eſt ut ad Arborum motum recurramus, quo diligenter inſpecto per aliquem ex quatuor numeris 1, 2, 3, 4, in Diarij Meteorologici Formâ notandis, Ventorum vires, ſeu gradus determinentur: hac lege, ut leniſſimum Aëris motum, adeoque minimam Venti vim eam dicamus, quâ vix Arborum folia agitentur, quamque numero 1 exponendam Jurinus jubet: ſumma ergò Venti violentia, hoc eſt quartus illius virium gradus, numero 4 ſignandus erit, cùm illius impetus maximè adversùs eaſdem Arbores, fortaſsè ad illarum eradicationem, furit: atque adeo intermedias vires numeris 2 & 3 exponendas monet: demum perfectam malaciam, hoc eſt nullam ſenſibilem Aëris & Arborum agitationem 0, ſeu zero ſignandam eſſe concludit.

IV. Mercurius in meo Barometro ſemel die 20 Maij ad dig. Lond. 28. 82. deſcendit, quæ fuit maxima eo anno depreſſio: fortiſſimus Auſter eâ die ſpirabat: & quamquam Thermometri liquor non parum à ſuâ maximâ rarefactione diſtaret; calor tamen ſuffocans homines torquebat. Maxima contrà in Barometro Mercurij altitudo, nempe dig. 29. 38. obſervata eſt die 10 Decembris, flante duobus virium gradibus E, aëre ſicco frigidoque, & fumante cum impetu Veſuvio. Cæterùm toto eo Menſe Mercurij

I

curij altitudo conſtantiſſimè major notata eſt, quàm reliquis Anni Menſibus : at 20, 21, 23 Novembris, ut & 16 & 17 Decembris ad dig. 29, 30, pervenit. Notandum mediam mei Barometri altitudinem eſſe dig. 29. 4.

Hæ ſunt Barometri Obſervationes. Reticendum tamen non eſt, quòd etſi Mercurij in illo aſcenſus Aëris ſerenitatem & Boreales Ventos, quemadmodum contrà illius deſcenſus imminentem Pluviam, & Ventos Auſtrales comitari ſoleat; nihilo tamen minùs non rarò prorſus oppoſitum obſervatum eſt, ut Mercurius ſubſidere ſereno cœlo, aſſurgere vaporibus referto aëre ſit viſus. Ut inde fortaſſe colligere quis poſſit ad varium Mercurij in Barometro motum, non tam Aëris externi pondus varium, quàm ipſius Mercurij alterationes & mutationes quaſdam concurrere poſſe.

V. Thermometrum ab Hauksbeio conſtructum hæc exhibuit phænomena. Calor hoc Anno maximus obſervatus eſt à 9 Julij uſque ad primos Auguſti dies. Die 23 & 24 Julij, ut & 17 ejuſdem ad ſummum gradum Calor devenit: hoc eſt devicto Frigore ad gr. 4. liquore ſcilicet ad num. 4. aſcendente. Aſcenſus hic etiam antecedentibus annis accidere conſuevit: verùm quod noſtro Anno peculiare fuit & inſolens, ut Æſtus maximus per viginti-duos dies, noctuque diuque ſemper ferè æqualis perennaret: liquore Thermometri circa numeros 5, 6, 7, & 8 ſe continente: ſi tamen 16 Julij excipias, quâ flantibus per vices S & N N W. cum tonitruis, pluit per intervalla ad digiti ferè altitudinem, quo tem-

tempore Thermometri liquor à gr. 8 ad 20 repente deſcendit.

Frigus maximum exeunte Anno præcedente, atque ineunte ſequente obſervatum, deſcendente liquore Thermometri ad gr. 56 & 57, quo tempore vel Nix in montibus videbatur, vel Gelu in Urbe concreſcebat. Menſe item Decembri, cùm Glacies viſa, liquor Thermometri ad gr. 55 & 56 depreſſus eſt. Quo loco notandum duco, in Tabellâ ad Thermometrum Hauksbeianum appoſitâ, notari ſignum Gelu (quod *Froſt* Anglicè appellatur) gradu 65. Mihi tamen plurium annorum obſervatione compertum eſt, Glaciem factam eſſe liquore ejuſdem Thermometri, ad me iſthinc miſſi, tantùm ad gr. 55 deſcendente*. Unde negari minime poteſt, ad Glaciei concretionem minori Frigoris gradu hîc Neapoli opus eſſe, quàm Londini. Quod phænomenon juſtæ Diſſertationis materiam ſubminiſtrabit, quam, Deo dante, exarabo, poſtquam & nonnulla ad rem facientia collegero, atque accuratiora experimenta inſtituero.

VI. Pauca nunc dicamus de noſtro Veſuvio. Hic ſanè per totum ferè annum ſiluit: verùm eo exeunte, poſt 9 Decembris, fumum interdiu, & quidem cum impetu, emittere cœpit, noctu aliquoties flammam: 20 verò ejuſdem crevit maximè & fumus & flamma. Hinc ſequentibus diebus fragor internus & ſtrepitus veluti tormentorum exploſorum ad multa milliaria exauditus, ut & ligneæ feneſtræ, & illarum vitra contremiſcerent. E montis cratere lapides igniti quoque in altum propulſi, qui deinde delapſi, ac cacuminis clivo adhærentes, & noſtræ Urbi, &

* *Vide* Tranſact. N° 424.

& remotioribus quoque locis non inelegans, etſi horrendum, ſpectaculum exhibebant. Cineres pro Ventorum determinatione & vi, per circumſtantes regiones, nunc procul, nunc prope diſpergebantur. A 27 & 28 Decembris die Fumus craſſiſſimus haud altè ſe attollens craſſo Cinere, quo ſcatebat, vicini-ora loca conſperſit. Poſt 29 diem Fumus ſenſim imminutus, & fragor: tandem poſt 4 ſequentis Januarij omnia omninò evanuerunt.

Nunciatum inſuper eſt, Ætnam eodem tempore & fumum & ignem ingentem cum fragoribus evomuiſſe: quemadmodùm & Strongylum ignivomum montem, inſolito ſtrepitu intonuiſſe, & immani flammâ conflagraſſe: ita ut Calabriæ Occidentalem oram incolentibus Inſulæ creber mugitus, atque erumpentes per vices cum ſtrepitu flammæ, Navalium claſſium adverſus ſe invicem tormentorum exploſione depugnantium, comparari potuiſſe viſæ fuerint.

VII. Annus hic quemadmodum fruges, ſegeteſque (ſi Indicum frumentum, Maiz, excipias) infra mediocritatem potulit; ſic Fructuum omnis generis ubertatem, Vinumque & abundantius & dulcius, quàm antecedenti anno præſtitit.

Reſtaret ſanè ut Hiſtoriam Terræmotûs, qui 18 Novembris die noſtram Urbem, ſed multò magis Principatûs Ulterioris Provinciam immaniter vexavit, hîc ſubnecteremus. Verùm quum adhuc veris accuratiſque Obſervationibus caremus; ab eo negotio ſuperſedendum nunc temporis duximus, donec certioribus factis inſtructi exactam illius Hiſtoriam concinnare valeamus.

V. *An Account of a Book entituled,* Jo. Ph. Breynij, M. D. &c. Diſſertatio Phyſica de *Poylthalamiis,* nova Teſtaceorum claſſe, &c. Gedani, 1732, 4to, *or a Phyſical Diſſertation of a new Claſs of Shells, which he ſtiles Polythalamiums, &c. with fourteen Copper Plates. By* Richard-Middleton Maſſey, *M. D. F. R. S. and Hon. F. C. Med.* Lond.

IN the firſt Chapter he diſcourſes of Shells in general, and premiſes a Method of placing them in different Claſſes, which he reduces to eight, *viz. Tubulus, Cochlidium, Polythalamium, Lepas, Concha, Conchoides, Balanus,* and *Echinus.*

The ſecond Chapter treats of *Polythalamiums,* which he defines a Tabulous Shell divided into ſeveral Cavities, conical, ſtraight, or regularly Spiral, with a Pipe, or Canal, paſſing through each Cavity. This again he ſubdivides into four, *viz.* 1. *Orthoceras,* 2. *Lituus,* 3. *Ammonia,* and 4. *Nautilus.*

The third Chapter treats of the *Nautilus* and *Nautilites,* which laſt he takes to be a Stone form'd under Ground in the Cavities of the *Nautilus.*

The fourth Chapter is of the *Ammonia* and *Ammonites.*

The fifth is of the *Lituus* (which he names from ſome Reſemblance it has to the *Lituus,* or *Croſier,* which

which the ancient *Roman Augurs* uſed in their Ceremonies) and the *Lituites* or Stone form'd in its Cavities under-ground. The Shell is yet unknown, but of the Stone he has given a curious Draught, as it appears in a Marble which was brought from *Oelandt*, an Iſland of *Sweden*.

The ſixth Chapter is of the *Orthoceras* and *Orthoceratites*, or ſtony Concretion in its Cavity. Of theſe laſt Stones he produces nine different Species, which he diſtinguiſhes chiefly by the Pipe, or Canal, which runs through them.

In his Note concerning the *Belemnites Pruſſici*, of which he deſcribes two Species, he takes notice that the ſtony Cone, or Nucleus of it, is never found articulate, as in thoſe that come from *Sweden*, and ſome other Countries.

At the latter end of his Book he propoſes a methodical Diſtribution of the *Echini* and *Echinites*, or Stones that are generated under Ground in the Cavities of the *Echini*.

The whole Method he propoſes for ranging Shells in general, may be ſeen in the following Table.

Te

Tabula

Tabula Methodica TESTACEORUM.

- Testa
  - Tubulosa
    - Monothalamia
      - TUBULUS
        - Dentalia
        - Entalia
        - Solen-univalvis
        - —unde Belemnites Pru
      - COCHLIDIUM
        - Nautilus tenuis
        - Auris marina
        - Nerita
        - Cochlea
        - Buccinum
        - Murex
        - Caſſis *
        - Cylindrum *
        - Voluta *
        - Porcellana *
    - Polythalamia
      - POLYTHALAMIUM
        - Nautilus
        - Ammonia
        - Lituus
        - Orthocerata
        - Patella
  - Vaſculoſa
    - Simplex
      - LEPAS
      - CONCHA
        - Chama
        - Mytulus
        - Tellen
        - Pinna
        - Oſtrea
        - Pecten
        - Anomia
        - Pholas
        - Concha Anatifera
    - Compoſita
      - CONCHOIDES
      - BALANUS
        - Balanus
      - ECHINUS
        - Echinometra
        - Echinoconus
        - Echinocorys
        - Echinanthos
        - Echinoſpatagus
        - Echinobriſſus
        - Echinodiſcus

VI. *An Account of a Book entituled,* Osteographia, *or, the Anatomy of the* Bones, *By* William Cheſelden, *Surgeon to her* Majeſty, *F. R. S. Surgeon to St.* Thomas's Hoſpital, *and Member of the Royal* Academy *of* Surgery *at* Paris. *By* John Belchier, *Surgeon, F. R. S.*

FOR the Frontiſpiece to the Book our Author has made choice of a Story very ſuitable to a Work of this Kind, which is a Deſcription that *Galen*, in *Lib.* 1. *Cap.* 2. *de Anatomicis Adminiſtrationibus*, relates of a Robber that was killed on a Mountain by a Traveller, whom he attack'd, and whoſe Body no one cared to have buried, but were rather glad that ſo wicked a Man ſhould become a Prey to the Vultures. Two Days after *Galen* went to ſee this Body, and found the Bones picked as clean as if prepared for the Inſtruction of Students.

This Opportunity he mentions as a Piece of good Fortune, becauſe, in thoſe Days, it was very rare to meet with a Skeleton, by what he obſerves to the young Phyſicians in the ſame Book, that he uſed to examine Bones which he found in Graves, and in the Ruins of Monuments; and once he met with a Body, which, by the over-flowing of a River, was waſh'd out of a Sepulchre that was ſlightly built on the Bank of the ſaid River; the Fleſh being deſtroy'd, the Bones were left entire.

He

He likewiſe takes notice, that there was a Skeleton in the Phyſick-School at *Alexandria*, which he thought would amply compenſate the Trouble of any one to go on Purpoſe to ſtudy.

The Figure repreſenting *Galen* contemplating the Skeleton, is taken from a Philoſopher of *Salvator Roſa*.

At the Bottom of the Title-Page he has given a Print of a *Camera Obſcura*, which he mentions in his Preface to have contriv'd and drawn all his Bones by; and without which Aſſiſtance (notwithſtanding he employ'd the greateſt Artiſts in their way) he found it impoſſible to give a true and perfect Repreſentation of them, there being ſo much Difficulty to expreſs the Outlines of Bones in their different Attitudes.

This occaſion'd my looking into *Veſalius*'s Book of Anatomy more carefully than I had done before, whoſe Figures have hitherto been eſteem'd the moſt beautiful of their Kind, and are perform'd in ſo exquiſite a Taſte, that they have uſually been taken for *Titian*'s, and always conſider'd as a Study for Painters.

Yet whoever will give himſelf the Trouble to meaſure his Bones with real ones, will find many egregious Errors, which would take up too much room here to particularize; but upon the whole I find there is no kind of Proportion kept, and that his Bones in general are between one Third and Fourth Parts too ſhort for their Breadth: And tho' his three Skeletons have been ſo remarkably famous, that ſeveral Anatomical Writers have copied after them, yet when carefully examined, it will be very eaſy to diſcover many Imperfections in them, though, all together, they ſtrike the Eye wonderfully.

This *Camera* he mentions not only as a great Help to him, by giving true Proportions and Outlines, but likewiſe for a more ſpeedy diſpatch; doing more this way in one Day, than could poſſibly be done without in ſeveral.

It is a long ſquare Tube ſet upon two Treſſels (as repreſented in the Print before his Book) whoſe Inſide is made black, to prevent the Reflection of Light; towards that End which is neareſt the Object, is a convex Glaſs placed in a ſliding Frame, thro' which the Rays paſſing from the Object, converge and meet in a Focus upon the Table-Glaſs placed near the other End, analagous to the Cryſtalline Humour and *Retina* in the Eye.

The Object here repreſented is the Trunk of a Skeleton fix'd to a Painter's Ezel, which being inverted, appears upright on the Table-Glaſs, on the rough Side of which the Artiſt delineates with a Pencil, which afterwards he traces off on Paper. The Convex Glaſs placed in the ſliding Frame being moved backward or forward, makes the Object bigger or leſs, keeping its due Proportions.

This *Camera* has ſeveral Advantages beyond the common one; for in this, Objects as big as the Life may be taken, or reduced gradually to any Scale; whereas the other only diminiſhes, and that in a very great Degree.

In this Work the gradual Increaſe of the Bones is deſcribed, even from the firſt Stages of Oſſification, to that of an Adult, when every Bone is repreſented as large as the Life in different Attitudes; as likewiſe moſt of the Bones ſaw'd through the Middle, to ſhew their internal Texture: And in order to ſhew how

how they are articulated to each other, there are ſeveral Plates wherein they are reduced to leſſer Scales, and again reduced, to give a View of them all united together in Repreſentations of ſix different Skeletons, where the Difference of the Growth of the Bones is very apparent, as likewiſe the different Shapes of the Male and Female Bones. There are likewiſe ſeveral Plates of Bones prepared on Purpoſe to ſhew the Ligaments which unite them together, as alſo the Cartilages at their Ends, beſides a great Variety of moſt curious and remarkable diſeaſed Bones.

And at the Front and Cloſe of every Chapter, as likewiſe the Blank Pages, are Skeletons of the moſt remarkable Animals of their kind, which are not only very ornamental, but even very uſeful; moſt of them deſcribing the Œconomy of the different Species of Animals.

The Author in his Treatiſe gives a general Deſcription of the whole Work, tho' not ſo minutely as ſome might expect, he thinking it uſeleſs to give long Deſcriptions in a Work of this Kind, one View of ſuch Prints ſhewing more than the fulleſt Deſcription can poſſibly do; for which reaſon, in the ſeveral Chapters, the mechanical Contrivances of the Bones are rather treated of than their Shapes.

Each Book has a double Set of Prints, one before they are letter'd, to ſhew them in their full Perfection; and the other with Letters, anſwering to their Deſcriptions.

The Advantage of a Set of Prints before they are letter'd, will readily be perceiv'd, when compared with the other: And how much theſe Figures excel any others of their kind, will appear at the firſt View, they

they being executed in ſo free and open a Stile, and expreſſed with ſo much Spirit, and (what is very rare) without the leaſt kind of Exaggeration.

At the End of his Preface he takes notice, that when he began this Work, he propoſed to go through the whole Syſtem of Anatomy, adorn'd with the Comparative, in three Volumes in this manner; the farther Proſecution of which Deſign he has now entirely laid aſide, it requiring ſo much Leiſure, as renders him incapable of the Performance; and the vaſt Expence attending ſuch a Work (beſides other Inconveniencies) will, I doubt, prevent the Execution of it by any Body elſe, eſpecially in ſo grand a manner, this being undoubtedly the moſt magnificent Work of the kind now extant.

F I N I S.

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PHILOSOPHICAL TRANSACTIONS.

For the Months of *January*, *February*, and *March*, 1734.

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Jos: Banks

I. *A*

LONDON:

Printed for W. INNYS and R. MANBY, Printers to the *Royal Society*, at the Weſt-End of St. *Paul's*.

MDCCXXXIV.

I. A Catalogue of the Fifty *Plants*, from *Chelſea Garden*, preſented to the *Royal Society* by the Company of *Apothecaries*, for the Year 1732; purſuant to the Direction of Sir *Hans Sloane*, Bart. Med. Reg. Præſ. Col. Reg. Med. & Soc. Reg. by *Iſaac Rand*, Apothecary, *F. R. S.*

501 ALkekengi Americanum; foliis ſinuatis; hirſutum. a D. Houſton.

502 Antirrhinum anguſtifolium, majus, peregrinum; ruberrimo flore. H. Reg. Par.

503. Antirrhinum arvenſe, majus, Italicum; majore flore ex albo purpuraſcente.

504. Aparines folio anomala; vaſculo ſeminali rotundo, multa Semina minutiſſima continente. Sloane, Cat. Iam. p. 50. Hiſt. Tab. 7. f. 4.

505. Apocynum Americanum; Euonymi folio; flore ex albo virente. a D. Houſton.

506. Aſteriſcus annuus, Luſitanicus, odoratus. Boerh. Ind. Alt. 105.

507. Aſtragalus humilis; Ornithopodij foliis, villoſis; ſiliquis propendentibus, brevibus, in ſpicam congeſtis.

508. Betonica Calpenſis; longiore folio, an; *Betonica rubicundiſſimo flore, Montis aurei.* H. Reg. Par?

509. Betonica major, Danica. Park Theat. 615.

510. Betonica purpurea. C. B. 231.

511. Bidens Americana, graminifolia & ramoſiſſima. *Hieracium, fruticoſum anguſtiſſimis gra-*

 mineis

mineis foliis; *capitulis parvis*. Sloane Hiſt. Vol. I. 255. Tab. 249 f. 3.

512. Bidens Americana, trifolia & quinquefolia; flore albo, amplo, radiato. *an Bidens trifolia Americana: Leucanthemi flore*. T. Inſt. 462?

513. Cardamine annua, glabra; parvo flore, foliis vix ſinuatis.

514. Cardamine Sicula; foliis Fumariæ T. Inſt. 224.

515. Caſſia herbacea; Pſeudoacaciæ foliis. a D. Collinſon. *Caſſia Marilandica; pinnis foliorum oblongis; calyce floris reflexo* Martyn. Hiſt. Plant. rar. Dec. III. No. I.

516. Chamæmelum trimeſtre, nudum; capitulis minimis.

517. Chryſanthemoides oſteoſpermon, Africanum, arboreum; foliis Populi albæ. Boerh. Ind. alt. 104.

518. Cnicus Creticus; Atractylidis folio & facie; flore candidiſſimo. T. Cor.

519. Corchoro affinis, Chamædryos folio; flore ſtamineo; ſeminibus atris quadrangulis, duplici ſerie diſpoſitis. Sloane Catal. Iam. p. 50. Hiſt. Tab. 94. f. 1.

520. Doria; quæ Jacobea Africana, fruteſcens; Lavendulæ folio, latiori. H. Amſt. 2. 141.

521. Eupatoriophalacron Americanum; Hyperici foliis; ſemine adunco. a D. Houſton.

522. Frutex Virginianus, trifolius; Ulmi Samaris. D. Baniſter Pluk. Almag. 159.

523. Fumaria Africana, veſicaria ſcandens. Par. Bat. App. *Cyſticapnos Africana, ſcandens. Boerh.* Ind. 310.

524. Hedyſarum triphyllum Canadenſe. Cornut. 44.

525. Hieracium

525. Hieracium medio nigrum, Bæticum, minus. Park. Theat. 792.

526. Hieracium medio nigrum, Bæticum, latifolium; amplo flore.

527. Jacobæa afra; folio Botryos. Boerh. Ind. alt. 99.

528. Jacobæa Pannonica prima. Cluſ. Hiſt. 21. *Senecio incanus pinguis* C. B. 131.

529. Ketmia Afra, veſicaria; foliis profundius inciſis, vix crenatis. Boer. Ind. 272.

530. Ketmia veſicaria, Africana. T. Inſt. 101.

531. Ketmia veſicaria, vulgaris. T. Inſt. 101.

532. Lepidium humile incanum arvenſe T. Inſt. 216. *Arabis ſive Draba & Naſturtium Babylonicum* Lob. Ic. 224.

533. Limonium, lignoſum, Gallis viduum. Boccon. Rar. 35.

534. Lotus Lybica Dalechampij. Lug. 509.

535. Lotus minor glabra; foliis longioribus & anguſtioribus. Hort. Edin.

536. Lotus pratenſis, major, glabra. D. Vaillant. Bot. Par.

537. Lyſimachia Canadenſis, lutea; folio Jalappæ. D. Sarrazen.

538. Meliſſa Americana, graveolens. à Domino Houſton.

539. Milleria Parietariæ folio; capitulis congeſtis, planis. D. Houſton.

540. Milleria Scrophulariæ amplo folio; floribus laxe ſpicatis. D. Houſton.

541. Nigella Orientalis; Flore flaveſcente; Semine alato, plano. T. Cor. 19.

 542. Nigella;

542. Nigella; flore minore, ſimplici candido, C. B. 145.

543. Nigella anguſtifolia; flore majore, ſimplici, cœruleo. C. B. 145.

544. Pulmonaria; calice veſicario.

545. Sherardia nodiflora; Stæchados ſerratæ foliis. D. Vaillant.

546. Sherardia repens, nodiflora, ſubrotundo folio. D. Houſton.

247. Sherardia ſpicata, annua; flore cœruleo; foliis anguſtis & ſerratis. D. Houſton.

548. Sinapiſtrum Americanum ſpinoſum; flore carneo; foliis trifidis & quinquifidis. D. Houſton.

549. Spergula, quæ Alſine ſexatilis & Multiflora; capillaceo folio. T. Inſt. 243.

550. Volubilis Americana; Bryoniæ folio; hirſutia Lappacea obſita. à D. Houſton. *Gronovia ſcandens*; *Lappacea, pampinea fronde* Houſton. Martyn. Hyſt. Plant. rar. Dec. IV. N° 8.

II. DE CAMPHORA THYMI. *Auctore Caſparo Neumanno, M. D. Chemiæ Profeſſ. Berolin. & R. S. S.*

Sectio I.

ANTE aliquot annos Illuſtri Regiæ Magnæ Britanniæ Scientiarum Societati Obſervationem quandam, * quæ ſingularis mihi viſa fuit atque in deſtillatione & ſeparatione Olei eſſentialis Thymi ex improviſo accidit, dum nempe in hoc, abſque omni additione deſtillato, Oleo corpus ſolidum, ſiccum, cryſtallinum, album & pellucidum apparuit, communicavi: ubi inter cætera adduxi, quod ſubſtantiam hanc,

* Vide Tranſact. N°. 389.

hanc, prout externô aſpectû & mixtione ipſius conſpiceretur, pro nulla re alia, quam pro Specie quadam Camphoræ dijudicare poſſim; quoniam, meô certè judiciô, ad nulla alia in terris alioquin exiſtentia mixta (in quantum Chymici hucuſque tam naturales quam artificiales materias notarunt, diſtinxerunt & ſecundum primarias ſuas qualitates denominarunt) è contrario omnium commodiſſimè & rationi maximè convenienter ad illud mixtum, ab antiquis jam temporibus Camphora appellatum, ſubordinari queat; hanc Obſervationem porro cum neceſſariis, quas judicabam, circumſtantiis animadverſionibuſque extendi: de reliquo verò ampliori indagationi atque judicio uniuſcujuſque commiſi, ut tam me ipſum, quam alios circa hanc materiam curioſos ulterius informarent. Placuit quoque Secretario celeberrimæ antedictæ Societatis eum mihi honorem deferre, & hanc Obſervationem Anno 1725. ipſorum pro menſe Julio & Auguſto ſub N° 389. publicè editis Tranſactionibus Philoſophicis inſerrere, pro quo honore publicas jam habeo atque perſolvo gratias. Cum vero ex alia in ſubſequenti mox numero, 390. pro Menſe Septembri & Octobri ejuſdem anni proſtante, Obſervatione de Camphora, à D. Joh. Brown, exercitato Chymico (quem jam Collegam meum honoratiſſimum in prædicta Regia Societate appellare mihi gratulor) traditâ perſpexi, illum à meo judicio de dicto producto Thymi ac nomine ipſi aſſignato planè diſſentire & penè in omnibus partibus aliam, primarióque illuc tendentem, fovere opinionem, quod hoc ex oleo deſtillato Thymi emergens corpus ſiccum, à me pro Specie quadam Camphoræ venditatum, proindéque nomine Camphoræ Thymi inſignitum, nulla ſit Camphora, miniméque ejuſmodi nomen mereatur, propterea pace veſtra (quoniam,

juxta

juxta tritum illud ſermone proverbium, quilibet verborum ſuorum optimus eſt interpres) mentem meam circa hæc, quæ ibi à me ſcripta ſunt, ſequentibus ulteriùs explicare mihi liceat, cum poſtea perinde mihi fuerit, an productum queſtionis à tertio nulli parti addicto, ſive mecum pro Camphora, ſive etiam cum Domino Brown pro Oleo habeatur.

Sect. II.

Ut rem brevibus complectar, modò dictus D. Brown

1. Productum hoc Thymi non eſſe Camphoram, inquit, ſed Oleum Thymi coagulatum ſeu condenſatum.

2. Circa hanc contradictionem nititur fundamento Experimentorum quorundam, in quibus vulgaris, Indica & officinalis Camphora aliter ſe habeat, quam ea à me nominata Camphora Thymi, adeóque hoc productum non eſſe Camphoram.

Jam equidem juſtam D. Brown intentionem, & in Chymia laudabilem profectò conſuetudinem; qua nempè non omnibus, quæ ab aliis dicta aut literis mandata ſunt, ſtatim applaudendum eſt, non ſolum debitis effero laudibus, ſed etiam affirmo, me contra iſta ab eo adducta Experimenta, diſtinctionem indigitantia, nihil habere quod regeram; interea hæc à cauſa principali me nondum deducunt neque in eam ſententiam convertunt, ac ſi iſtæ à D. Brown obſervatæ differentiæ inter Camphoram communem & Camphoram Thymi jam ſatis ſufficientes eſſent, ut me convincerent, quod Productum hoc Thymi propterea non ſit Camphora.

Sect.

Sect. III.

Dixi nempe in antedicta mea Obſervatione primò in genere, acquiſiviſſe me ex noſtrati Thymo vulgari veram, denſam, cryſtalliformem & in omnibus qualitatibus conſpirantem, nec niſi odore differentem Camphoram, &c. In ſpecie verò porrò adduxi.

I. Quô modô Camphoram hanc acquiſiverim.

II. Quâ de causâ Subſtantiam illam pro Camphora habeam.

III. Ex quibus partibus Camphora conſiſtat.

IV. Et denique, quod hanc Camphoram Thymi in omnibus qualitatibus præcipuis, odore exceptô, cum Camphora vulgari convenientem exiſtimem.

Sect. IV.

Ad hæc D. Brown, Præparatum vel Productum hocce exiſtere quidem fatetur, dicens, tale quippiam jam antea ibi viſum fuiſſe, id quod non equidem impugno, quamvis toto iſto quinquennio, in Anglia olim degens, nunquam illud audiverim, multò minus oculis meis creverim; ſic etiam concedit externam formam, nomen tantummodò huic producto deditum, vel quod Camphora ſit, in dubium vocat, & impugnat. Atque ſic porrô in aliis quibuſdam rebus à me diſſentit.

Sect. V.

Quod vero hoc Præparatum Thymi nulli alij reiquam Camphoræ accenſere potuerim, ſequentes me impulerunt rationes:

I. Ex

I. Ex Oleo eſſentiali ortum eſt.

II. Planè album, tranſparens; pellucidum, cryſtallinum, ſiccum & durum, friabile tamen, denique & fortiter olens corpus, exiſtit.

III. Nullô modô ſolutionem in aqua admittit.

IV. Contrà facile in Spiritu Vini rectificatiſſimo & Spiritu Nitri ſolvitur.

V. Demonſtrabiles partes conſtitutivæ hujus Producti Thymi eædem ſunt, quæ in communi Camphora, quamvis

(a) Ratione odoris ſpecifici,

(b) Ratione proportionis partium conſtituentium, &

(c) Ratione quoque loci natalis vel Climatis, notabilis occurrat differentia, & exindè etiam variæ ſubtiles diſcrepantiæ circa commixtiones ac relationes cum aliis rebus oriri poſſint.

VI. Denique etiam Mixtum ita conſtitutum nullo meliore vel convenientiore, ex omnibus hucuſque notis naturalibus & artificialibus ſpeciebus, circa quas Chymia verſatur, quam Camphoræ nomine inſignire potui, ſiquidem hæc ſubſtantia nec Sal volatile nec Sal fixum, nec Terra, nec Lapis, nec Succus condenſatus, nec Bitumen, nec Gummi, nec Reſina, nec Sulphur, nec Flores, non Præcipitatum nec Sublimatum, non Pix nec Cera, non Phoſphorus nec Vitrum, non Glacies nec Glarea eſt, aut appellari poteſt. Multò minus huic duro, ſicco & cryſtallino corpori nomen rei molliter unctuoſæ, omnium minimè rei tenuiſſimè pinguedinoſæ vel oleoſæ aut humido-liquidæ imponere poteram, dum neque Balſamum neque Linimentum, neque Coagulum neque Butyrum, neque Oleum neque Pinguedo, neque

Spiritus

Spiritus neque Aqua, Lacryma, Vinum, Liquor, Acetum vel aliud tale quippiam exiſtit. Et ſic in hunc uſque diem nihil melius & convenientius quam Camphoram excogitare vel ullô modô invenire poſſum, quo cum majori & rectiore jure comparari vel quo alio præſtantiore nomine exprimi queat.

Sect. VI.

Horum reſpectu & propter deſcriptas jam Proprietates, haſce ex Oleo deſtillato acquiſitas, elegantes, albas, ſiccas, pellucidas, ſolidas, friabiles tamen inſimulque fragrantes & in aqua non ſolubiles, contra in Spiritu Vini rectificatiſſimo & Spiritu Nitri ſolubiles Cryſtallos, Camphoram, & pro diſcrimine communis aliarumque ſpecierum Camphoræ, Camphoram Thymi appellare commotus ſum, ſimulque affirmavi, eam in omnibus his adductis proprietatibus cum Camphora Indica officinali convenire, quamvis omnium & ſingularum particularium affectationum, affinitatum, effectuum, diſtinctionum ſubdiviſionumque minorum nullam tum temporis habuerim rationem, præcipuè cum non adeò magnam ejus portionem acquiſiveram, qua inveſtigationes ad ejuſmodi experimenta requiſitas inſtituere potuiſſem, ut taceam, quod in genere, uti poſteà majori experientia edoctus ſum, Vegetabilia Europæa parum tantum hujuſmodi Camphoriformis ſubſtantiæ ſuppeditent, ea autem puto, quæ à natura diſpoſita ſunt, ut ejuſmodi quippiam largiantur. Quis verò, iſtas tum à me adductas & jam brevibus repetitas proprietates præcellentes Pro-

ducti noſtri Thymi cum communi Camphora non convenire, probare poterit ? Vel quo magis convenienti & compatibili quam Camphoræ nomine mixtum hoc, ut unô verbô mixtionem ejus optimô propriôque charactere indicarem & ſimul illud ab omnibus aliis in mundo cognitis mixtis perſpicuè diſtinguerem, inſignire aut denotare potuiſſem.

Sect. VII.

Nam ut tales albas, pellucidas diviſas, ſatis magnas, ſiccas, ſolidas, & ſi concutiantur, ſonantes Cryſtallos Oleum appellem vel pro Oleo venditem, ſicut ſæpè dicto D. Brown eas nuncupare libuit, hoc neque honoratiſſimus hic Collega meus, neque alius quiſquam tam facile perſuadere mihi poterit. Et quamvis exiſtimet, ſe Præparatum hoc cognomine coagulati ſeu Condenſati præmunire poſſe, aſſerens : Oleum condenſatum & coagulatum eſſe, nihil tamen ea omnia ad ſummam rei faciunt, dum ſcilicet ſic nominata Olea in alio planè ſtatu apparent & in Chymia prorſus alia eſſe reperiuntur, de quibus mentem meam ulterius jam explicaturus ſum.

Sect. VIII.

D. Brown primò, has Cryſtallos Thymi, quas Camphoram appellavi & adhuc appello, Oleum eſſe aſſerit ; quod autem hac in re huic aliàs egregio Viro aſſentiri non poſſim, ſequentes notabiles ſane & apertè differentes interdicunt circumſtantiæ :

Cryſtalli

Cryſtalli hæ attactu ſunt ſiccæ adeoque non molles, vel unctuoſæ aut pingues, ſed planè cryſtallinæ & diviſæ, quæ ſolæ proprietates pro repudiatione nominis Olei ſufficientes eſſent, ſiquidem Naturæ Olei è diametro oppoſitæ ſunt & nomen Olei ſicco & cryſtallino tali mixto nunquam, imo de jure, nulli alij rei, quam planè liquidæ, pingui vel ad ſummum butyraceo-unctuoſæ convenit.

Sect. IX.

Secundò probationem hujus Characteris fulcire nititur expreſſione adjectiva vel verbo Coagulatum, dicens: Eſt Oleum coagulatum. Cui verò porro amice regerere mihi liceat, quod & hîc epitheton illud non ſatis ſit ſufficiens:

1. Quia in univerſa Chymia nomen, Coagulatum, nunquam ejuſmodi rei attribui poteſt nec debet, quæ planè ſicca & ſimul cryſtallina adeóque nec pinguis-unctuoſa nec humido-aquea eſt; è contrario.

2. Tantum & unicè iſtiuſmodi rebus ac circumſtantiis attribuendum vel addendum eſt, in quibus ſivè ſubitò ſive pedetentim, ſivè ex pluribus aut paucioribus humiditatibus vel tenuiter liquida pinguedine, ſive etiam per ſe ſive per additionem alterius rei, aliquid quaſi præcipitando ſeſe colligit, atque conſiſtentiam, inſtar lactis coagulati vel Offæ albæ Helmontij, vel Roob, vel Butyri & Unguenti vel reſinoſo-viſcoſi aſſumit, Productum poſtea ſit ſive ſalinum, terreſtre, pingue, reſinoſum vel prout velit. Quamdiu nomen Coagulum vel Coagulatum ipſi attribuitur, tam diu non poteſt eſſe ſiccum,

ſed attactu humido-pingue vel reſinoſo-viſcoſum aut unctuoſum exiſtere oportet. Et poſito! quod hoc verbum Coagulum vel Coagulatum etiam ad res planè ſicca conſiſtentia prædictas detorqueatur vel vi detorqueri debeat, licet hactenus in Chymia illud non introductum ſit, hoc ſaltem concedere neceſſum erit, id nunquam ad corpus pellucidum, cryſtallinum, in ſeparatis, perſpicuis, ſiccis, ordinê compoſitis & uti Sal cryſtallinum apparentibus, ad crepitationem uſque duris fruſtis conſiſtens extendendum, adeóque tale quid minime Coagulum vel Oleum coagulatum appellandum eſſe, quippe quod hactenus nondum auditum aut receptum fuit.

3. Omnia Olea coagulata, *e. gr.* Oleum Aniſi, Rutæ, Olivarum, &c. ſi loco frigido vel tempore brumali etiam ad ſummum coagulentur, nequaquam tamen in ſiccas, planè duras, uti Tartarus vitriolatus, & adhuc majores quaſi Saccharum candidum album repræſentantes, adeóque in concutiendo crepitantes vel ſonantes Cryſtallos, ſed ad ſummum externo aſpectu ut tenuiſſima folia, attactu tamen digitos pinguefacientes & rigidæ quaſi apparentes particulas, adhæc vero maxima ex parte in perpetuò butyraceam vel adipoſam conſiſtentiam, adeóque nunquam in talem Camphoræ ſimilem duritiem degenerare ſolent.

4. Olea quoque coagulata, vel leviori accedente calore, mox liqueſcere & tenuiora fieri, ſtatumque coagulationis ſuæ amittere ſolent, quod vero in noſtris Cryſtallis reperire non licet, quia hæ tam æſtate quam hyeme, quinimo conſultò applicato leni calore in æquali ſemper ſolida forma permanent.

Sect. X.

Tertiò D. Brown adhuc utitur Verbo Condenſatum, Cryſtallos nempè vocat Oleum coagulatum ſeu condenſatum. Si dixiſſet, Cryſtallos eſſe Corpus ex Oleo condenſatum, tunc eandem mecum haberet ſententiam quam ipſe in Obſervatione mea, pag. 327. ſub N° 3. adduxi; dum vero ſimpliciter eas pro Oleo habet, ei minime aſſentiri poſſum, ſiquidem hoc magnam præbeat differentiam, quando dico: ex Oleo natum, condenſatum vel ſeparatum; & è contrario quando de Oleo condenſato ſeu coagulato verba facio: Per hanc enim poſteriorem loquendi formulam totum intelligitur Oleum; per priorem vero tantùm aliquod ſeparatum, de novo productum & ex Oleo jam demum exortum planeque aliter, quam reliquum Oleum viſui ſe objiciens. Id Oleum, quod ſe coagulari vel condenſari patitur, illud non tantum centeſimâ, quinquageſimâ vel vigeſimâ ex parte fieri ſolet, ſed ejuſmodi Oleum penitus penituſque, ſi non in toto ſaltem plurimo & maximo pondere ſe coagulare & condenſare debet. Qua vero ratione fit, ut hic in Oleo Thymi parvum tantum pondus elegantium harum Cryſtallorum oriatur vel ſeparetur, omneque reliquum Oleum ne minimam quidem mutationem aut veſtigium coagulationis vel condenſationis monſtret, ſed in perfectè liquida & debite tenuiterque oleoſa conſiſtentia, ſicut Oleum Thymi purum eſt atque eſſe ſolet, æqualiter permaneat? Aliud eſt ea materia ex qua aliquid fit, & aliud quoque eſt illud, quod ex ea paratur: in præſenti noſtra materia utique in principio adeſt Oleum & quidem Oleum deſtillatum eſſentiale; poſtquam autem

autem ex hoc ipſo nova planè ſubſtantia denuò oritur, generatur vel ex Oleo ſeparatur & producitur, quæ tactu, viſu vel forma externa cum ipſo Oleo minimè convenit, hoc jam clarum pellucidum, album, ſolidum & cryſtallinum corpus nunquam pro priori fuſco-rubro tenui & liquido oleo exiſtimare poſſum, tanto minus, cum etiam non omne Oleum coaguletur vel condenſetur, hinc ſubſtantiam illam pro Oleo coagulato ſeu condenſato accipere queo, licet corpus hoc ex Oleo ſeparatum & condenſatum ſeu potius cryſtalliſatum ſit. Quod ſi hæc methodus invaleſceret, ut ſeparata & præparata ex hoc vel illo ſubjecto ſemper cum eodem nomine illius ſubjecti ex quo ſeparata ſunt, inſignirentur, & cognomen tantum aliquod adjiceretur, tum exindè miræ concluſiones & ſtupendæ confuſiones in Chymia orirentur, ſic & in enarrationibus & deſcriptionibus rerum artificialium ferè nil niſi æquivocus, obſcurus & incertus ſenſus produceretur. Si hoc valeret, ut Camphora ex hac tantum cauſa poſſit appellari Oleum, quia ex Oleo orta eſt, & ratione conſiſtentiæ figuræque tantummodò cognomen coagulatum vel condenſatum adjicere, adeoque ſic ab omnibus objectionibus ſimul & ſemel me liberare poſſem, tunc quoque hoc rectum ac juſtum eſſe deberet, ſi communem frumenti ſpiritum appellarem Frumentum vel ſemen liquidum, Hordeum rarefactum, Triticum ſpirituoſum & ſic porrò, quia ſcilicet ex ſeminibus iſtis paratus fuit. Hoc modô Flores Antimonij etiam Antimonium volatile; Spiritus Sulphuris, Sulphur aquoſum; Phoſphorus, Urina coagulata; Sal lixivioſum cryſtallinum, Cineres condenſati, & ſic plura alia ſecundum nomen materiæ ex qua præparata ſunt, nuncupari

 deberent,

deberent, quia circa hæc omnia eôdem jure probari poteſt, quod ex iis orta vel præparata ſint, quô affirmare queo, Camphoram Thymi obortam eſſe ex Oleo Thymi, & ſic complures materiæ aliter prolixiuſque denominari atque circumſcribi poſſent ; niſi

a. Ad externas quoque differentias, conſiſtentiam, aſpectum, ſiccitatem, humiditatem, pinguedinem, liquiditatem, pelluciditatem, opacitatem, ſoliditatem, duritiem, mollitiem, pluresque alias circumſtantias animus adverteretur, & ſimul

b. Tritum in ſcholis proverbium: quod fieri poteſt per pauca, &c. puto, quomodo quis mentem ſuam omnium breviſſimè & maximè notanter exprimere poſſit, in conſiderationem veniret.

Quod ſi igitur Materiam quandam unicô vocabulô characteriſticô denotare poſſum, quare hoc evitare & potius duo vel plura adhibere, adeoque, loco verbi Camphora, Oleum coagulatum ſeu condenſatum dicere deberem? Sufficit! & quilibet intelligit, cum verbum Camphora adhibeo, quod ſit corpus Cryſtallinum atque condenſatum, immo ex Oleo condenſatum & maximam partem ex oleoſis partibus conſiſtens. Adhæc diverſi in Chymia dantur modi, ubi ex ſubſtantia liquida corpus ſiccum acquiritur, ideoque & hîc benè diſtinguendum, nec ubique omnia, verbis coagulatum & condenſatum, deſcribenda ſunt, ſiquidem inter coagulatum ac cryſtalliſatum, inter congelatum, condenſatum, inſpiſſatum, præcipitatum atque ſublimatum, & quæ ulteriores ejuſmodi ſunt methodi, non exigua exiſtit differentia.

Sect. XI.

Hæc ergo mea fortè eſt explicatio, quare iſtas ex Oleo Thymi acquiſitas Cryſtallos appellaverim Camphoram, eaſque non olei nomine aut alio quodam cognomine inſignire judicaverim. De reliquo mihi perindè erit, ſi D. Brown aliiſque illas Oleum vel Sal volatile vel quoquomodo velint, nominare libuerit.

Sect. XII.

Præterea ego nec primus nec ſolus in terrarum orbe ſum, qui ejuſmodi ex Europæis Oleis eſſentialibus comparatum mixtum Camphoræ nomine inſigniverim, ſed & alij quidam ineruditis certè non adnumerati viri idem mecum fecerunt. Ut prolixitatem effugiam, ad duos tantummodo iſtos, quos ipſe D. Brown allegavit, provocabo:

1. Eruditus & celeb. Leydenſium Profeſſor D. D. Boerhaave in Libro à D. Brown adducto, qui dicitur Chymiæ inſtitutiones & Experimenta, pag. 82. (cujus loci ipſe D. Brown, pag. 365. meminit): " Nam " (Camphora) inquit, non ſolum eſt progenies ſo- " lius arboris Camphoræ, N. B. Sed omnes plantæ " aromaticæ Camphoram ſui generis producere " poſſunt," prout & D. Boerhaave de hiſce in Collegiis & Lectionibus ſuis quam ſæpiſſimè mentem ulterius explicavit, ex quibus nempe Europæorum Oleis Camphora acquiri poſſit.

2. Egregius ille in eruditione, experientia que celeb. Pariſienſ. Chymicus D. Geoffroy junior, quem

D. Brown

D. Brown locô citatô itidem adducit, in dicta Observatione Academ. Scientiarum Anno 1721. edita, ait ; " L'Huile Terebinthine, quoique rectifiée à l'eau " dépose aux parois de la bouteille des criſtaux " ſemblables à des aiguilles de Camphre ſublimé. " J'ai obſerve la même choſe dans les Eſſences de " Matricaire, de Marjolaine, &c. Et porro : " L' " Huile de Sauge, par exemple, & celle de Ro- " marin, prennent en-vieilliſſant à peu près la même " odeur. Il y en a même quelquefois, qui appro- " chent de l'odeur du Camphre. J'ai eu de l'eau de " ſauge, qui gardée pendant plus d'un an, avoit " acquis une odeur de Camphre très-forte, enſorte " qu'on l'auroit priſe pour de l'eau, dans laquelle on " auroit éteint du Camphre même, &c." Quanquam D. Brown etiam tantorum Virorum experimenta atque enarrationes acceptare recuſet & de eis dubitare videatur, tanto minus diverſis adhuc aliis manus daturus erit, è quibus apparuit, quod non ſolum ex variis Vegetabilium Indiæ Orientalis partibus, extra propriè ſic dictam Arborem Camphoriferam, *e. gr.* è Radice Arboris Cinnamomi, Zedoariâ & Mentha Zeylanica, iſtiuſque loci creſcente Schœnantho, Abrotano, Millefolio, Cardamomo, Junipero, &c. ſed ex Europæorum etiam Salvia, Roremarino, Hyſſopo, Majorana, &c. &c. (præter Thymum) acquiſita fuerit Camphora. Licet enim D. Brown, pag. 361. his utatur verbis : " At in nullis aliis Oleis (præterquam Oleo Thymi) " aliquid hujus generis me vidiſſe memini, niſi in " Oleo Macis, de quo pag. ſeq. mentionem facit : " in ſuperiore parte hujus Olei, aliquid cryſtallinæ " formæ hodie fluctuare videtur ; attamen cujus

 " generis

" generis ſit ſubſtantia, ſive Camphora, ſive non, " tempus docebit; " Nihilo tamen ſcius alij tale quid ſæpius viderunt & obſervarunt, adeóque hoc argumenti loco inſervire minimè valet, quod D. Brown nondum vidit, id nemo unquam hominum in mundo vidit, aut ejuſmodi quid nunquam accidit nec accidere potuit, multo minus, quod omnia planè falſa ſint, quæ D. Brown non vidit nec approbat: Sed hæc tam parum convincent animum, ac ſi ego dicere auderem, hoc vel illud, quod D. Brown in Chymicis ſuis tentaminibus vel laboribus conſuetis interdum fortè obvenerit, nunquam reverâ ita accidiſſe, idque hac tantum præoccupatione fultus, quia iſta ego non viderim. In P. S. equidem, D. Manel ei Camphoram Majoranæ monſtraſſe, fatetur, quia verò differentias aliquas cum liquoribus aliis, eâdem ratione uti Camphora Thymi, adeóque non in omnibus relationibus eôdem modô, ſicut Camphora communis ſeſe exhibuerit, hinc etiam ipſi non Camphora, ſed Oleum coagulatum audit.

Sect. XIII.

Pag. 363 & 365. D. Brown de opinione ſua, quod Camphora Thymi ſit Oleum coagulatum, quodammodo dubitare, vel, ut rectius dicam, medius hærere videtur, ait enim loco poſteriore: " Quod ad " hoc *Sal*, ſeu Oleum coagulatum Thymi, &c. & " loco priore: Quibus non abs re fuerit, teſtimo- " nia quædam de Oleis coagulatis, ſeu *Salibus* ex " Oleis natis, huc pertinentia, ſubjungere." Ex his patet, dum nempe Cryſtallos quæſtionis Sal ſeu Oleum, Oleum coagulatum ſeu Sal ex Oleo natum appel-

appellat, quod adhuc quaſi non ſatis certus ſit nec ſecum conſentiat, ipſas Cryſtallos certè nihil aliud quam Oleum, ſed fortè pari ratione tam Sal, quam Oleum eſſe, licet pag. 361. vel non procul à principio Tractatus ejus, nomen Salis ipſi abneget, dum ita loquitur: quod hactenus *improprio* Salis Thymi volatilis *nomine* dictum fuit. Hæ ipſi dubiæ de Sale cogitationes non tantum in duobus illis locis & fortè caſû elapſis verbis Sal ſeu Oleum, ſed & tanto dilucidius exinde colligendæ ſunt, quia circa hanc materiam, pag. 364, adhuc alios tres eruditos Viros, nempe D. D. Slare, Helmontium & Clar. Boerhaavium adducit; Venerabilem ſcilicet D. Slare Camphoram Thymi appellaſſe Sal volatile (cum tamen in Aqua ſolutionem non admittat, quippe qua ſola generali Salium probatione à charactere Salis excluditur) item, in Oleo Cinnamomi quoddam Salis præcipitatum obſervatum fuiſſe, quod tamen nihil aliud quam Camphora eſſe potuit, quia ipſe addit, hoc Oleum ſine ullo additamento aut arte ad Salis formam inducendam deſtillatum fuiſſe. E contrario reliqua huc allegata exempla ex Helmontio & Boerhaavio, ad hanc materiam vel ad probationem Salis volatilis nativi aut Camphoram repræſentantis, planè non quadrant, dum hi duo Viri poſteriores de longè alio ac reali Sale, nempè de Sale volatili artificiali, i. e. de Sale volatili ex Oleo & Sale alcalino-fixo facto loquuntur aut ſcribunt, prout & ipſe D. Brown hoc allegat, idque facilè perpendere debuiſſet, inquit enim: Helmontius de Sale ex eôdem Oleo artefactô ſic locutus eſt: " At quando Oleum Cinnamomi ſuo Sali Alkali miſcetur, &c. & ſic etiam iſte à D. Boerhaave, pag. 364, ex Experimento

Hombergiano allegatus Sal ſeu Sapo (uti D. Boerhaave eum appellat) verum aliquod cum Sale quodam alcalino nudo commixtum Sal volatile fuiſſe oportet, ſi reverâ in aqua ſolubile fuit; quod ſi verò, abſque additione, per ſe in forma ſalis ſeſe apoſuit, certè nihil aliud quam Camphora, adeóque in aqua nullô modô ſolubilis aut cum ea permiſcibilis fuiſſe potuit, unde dictus D. Boerhaave adjicit: Sed Experimentum non facilè imitari poſſumus, i. e. ſi abſque additione Sal volatile in Aqua ſolubile vel Saponem acquirere volumus.

Sect. XIV.

In priore mea Obſervatione, pag. 329, definitionem vel deſcriptionem ſuppeditavi de Mixtione Camphoræ ſive de partibus ejus conſtitutivis, quod primario 1. ex principio inflammabili & igneſcente vel Phlogiſto rarefacto, i. e. ſubtili ſulphurea ſubſtantia conſiſtat, quale Principium alij ſimpliciter Sulphur (in ſenſu lato) alij verò ut Beccher & Stahl etiam Terram Sulphuream, inflammabilem, Terram ſecundam, igneſcibilem & phlogiſtam, unô autem verbô plerumque φλογιστὸν appellare ſolent, ubi his uſus ſum verbis: Conſtat rarefactô phlogiſtô, vel prout Manuſcriptum meum habet: Conſtat ex rarefacto phlogiſto, & hoc conſtituens primô locô poſui, quia quoad quantitatem in mixtionis proportione maximam conſtituit partem. Quamvis equidem optimo jure, loco hujus, dicere potuiſſem: Camphora conſtat (primò) ex Oleo vel particulis oleoſis, quippe quod hîc potiſſimum intendebam, attamen hôc locô, certis de cauſis, expreſſionem illam

illam adhibere nolui, quia deſcriptionem modò in ſenſu phyſico, quoad principia dedi, dum Oleum rurſus è principio inflammabili, Aqua & Terra conſiſtit; proindè hic de nulla æquivoca explicatione cogitavi nec eam pertimui, certiſſimè perſuaſus, quod hæc chymica loquendi formula, ſi aliquid deſcribere volumus, ex quo quid conſtet, vel quas partes conſtitutivas contineat, unicuique præcipuè Chymi o, ſatis nota & perſpecta ſit, ſiquidem etiam ipſimet D. Angli, quando vocem Anglicam illam, *it conſiſts*, latine reddere volunt, idem quantum mihi ſuccurrit verbum *conſtat*, & tum porrò ablativum vel cum Præpoſitione *ex* vel etiam ſine ea adhibent, hæc quoque loquendi formula in omnibus Chymicorum libris ſatis trita eſt & reperibilis; attamen D. Brown, tria iſta verba: conſtat rarefacto Phlogiſto, planè aliô modô explicare & ita intelligere, non dicam detorquere placet, ac ſi dixiſſem, quod in igne conſtans ſit vel igni reſiſtat, ait enim: Hæc ſunt Neumanni verba, at minimè noſtrum: Nam ſi igni admoveatur, &c. de qua tamen opinione ego nunquam cogitavi, tantum abeſt ut in hac intentione talia literis conſignaverim, alias et enim partes conſtituentes non denotaſſem numeris, nec hoc ſub N° 1, uti aquoſum & terreum ſed N° 2 & 3 adduxiſſem, ſed ſi opinio mea cum explicatione D. Brown concordaſſet, tunc profectò de proprietatibus & relationibus Camphoræ ſolicitus fuiſſem. Interim ex hac malè intellecta explicatione certior ſis, D. Brown noſtri cērtè magni & planè eximij Chymici D. Stahlij ſcripta nondum legiſſe, adeóque etiam de hac ipſi tam uſuali expreſſione vel verbo φλογιστὸν verum conceptum non poſſidere.

SECT.

Sect. XV.

Tandem etiam in conſiderationem veniunt obſervatæ à D. Brown differentiæ inter Camphoram Thymi & Camphoram communem, quarum diverſas in medium adducit, quæque procul dubio ipſum maximè commoverunt ut crederet & publicè ſcriberet, quod hæc ex Oleo Thymi acquiſita ſubſtantia cryſtallina non ſit Camphora eam ob rationem, quia non in omnibus relationibus, aliis admixta rebus, cum Camphora vulgari conveniret, ſed planè aliô modô ſeſe gereret.

Jam equidem de veritate harum Obſervationum nullum mihi eſt dubium, ac lubens confiteor, quod, ſi Camphora Thymi ſecundum reliquas relationes in & cum aliis corporibus eoúſque extendenda eſt, hæc à Camphora communi notabiliter differat, adeóque in hoc D. Brown abſque ulla contradictione manus porrigam, verum ea tum temporis, ut illuc uſque extendatur, mea intentio nunquam fuit, quin potius primarias modò & præcipuas imprimiſque in ſenſus incurrentes proprietates, quibus tam communis Camphora quam Camphora Thymi præ aliis mixtis in mundo ſeſe diſtinguunt, in animum induxi, de reliquis omnibus differentiis & qualitatibus particularibus minus ſolicitus, neque (uti jam ſuprà dixi) parvo iſto, quod acquiſiveram, pondere, ejuſmodi ulteriores inveſtigationes peragere potui.

Sect.

Sect. XVI.

Quæ me proindè ad æquiparationem Camphoræ Thymi cum Camphora officinali commoverunt, ſunt ſequentia.

1. Productum Thymi oritur ex Oleo eſſentiali; ſic quoque ordinaria exoritur Camphora.

2. Eſt corpus ſiccum & ſolidum; tale etiam Camphora communis.

3. Simul tamen friabile; Camphora itidem: quamvis D. Brown hanc friabilitatem, quam cum meis Cryſtallis unicuique monſtrare poſſum, perindè neget.

4. Eſt album; ita & Camphora.

5. Clarum & pellucidum; eâdem ratione quoque Camphora.

6. Conſiſtit ex Cryſtallis diviſis; ſimiliter etiam cruda & non depurata Camphora.

7. Quoad odorem fortiter imitatur ſuum Oleum vel ſuam ſpeciem; ſic etiam Camphora.

8. Reſpuit ſolutionem in aqua, quam Camphora itidem aſpernatur.

9. E contrario penitus & facilè ſolvitur à Spiritu vini rectificato, id quod etiam de vulgari Camphora notiſſimum eſt.

10. Diſſolvitur etiam à Spiritu Nitri; eâdem ratione quoque Camphora.

Exiſtimarem profectò, quod hæ convenientiæ, conformitates & circumſtantiæ comparabiles ſatis ſufficientes eſſent, talem hoc modo ſeſe habentem ſubſtantiam, abſque prolixiore conſideratione pro primo Camphoram appellandi.

Sect. XVII.

Differentiæ cujuſdam generalis, pag. 329. §4. mentio à me facta eſt, quod nempe ex ſic dicta arbore Camphorifera ibidem in magna copia & ita longe plus Camphoræ, quam Olei, haberi queat, cum è contrario Vegetabilia Europæorum plurimum Olei, parum verò Camphoræ largiantur. Cui jam hoc adhuc addo, quia Camphoræ Europææ ex multo Oleo & pauciori portione Camphoræ conſiſtunt, adeoque hæ Camphoræ in ſua mixtione multò oleoſiores, vel reſpectu communis Indiæ Orientalis Camphoræ, cum partibus Oleoſis magis, ut ita dicam, ſuperſaturatæ ac cum aliis partibus propterea non ita firmiter unitæ ſunt, Camphora officinalis vero, in proportione ingredientium, paucioribus Oleoſis, è contrario pluribus terreſtribus partibus inſtructa & in hac poſteriore in genere omnia conſtitutiva firmius meliuſque immixta reperiuntur, quod exindè etiam in commixtione cum aliis liquoribus, porrò ratione ſublimationis, ſolutionis cum Oleo Vitrioli, ratione exhalationis, præcipitationis aliarumque relationum, tantò facilius notabilis differentia inter has duas ſpecies ſeſe exſerere poſſit; hinc tamen illa haud ſequitur concluſio: quia Camphora Thymi in omnibus & ſingulis relationibus cum Camphora vulgari non convenit, ergo hoc Productum Thymi non eſt Camphora. Si enim in Chymia in omnibus ferè rebus unicè ac ſolum ad relationes differentes particulares reſpicere, convenientes vero generales proprietates obſervatuque maximè digniores plane non attendere, ſed tantum ſuperficiariè eas intueri & è contrario à prioribus con-

concluſiones noſtras formare vellemus, tunc rēs profectò pauciſſimæ comparari poſſent, plurimæ autem ſæpè in nimis prolixum maléque cohærens judicium dilaberentur.

Sect. XVIII.

De duabus tantum materiis, nempè de Metallis & Salibus exemplum aliquod proponam:

A. 1. Omnibus notiſſimum eſt, aurum, argentum, cuprum, ferrum, ſtannum & plumbum pro perfectis Metallis & Mercurium vivum pro Semimetallo ſive Metallo imperfecto haberi, eam ob rationem, quia hæ ſubſtantiæ præcipuas proprietates ejuſmodi rei poſſident, quæ Metallum vocatur, adeoque neque ad lapides neque terras, ſulphura, bitumina, ſalia, vitra, neque ad res ullas alias, brevi, ad nihil melius in univerſo terrarum orbe, quam ad Metalla comparari poſſunt, ſicuti & ego Camphoram Thymi, juxta ſupra deſcriptas ejuſdem proprietates, nulli alij rei convenientius aut melius, quam Camphoræ accenſere & ſic denominare potui; prout verò D. Brown ratiocinatur, antedicta Metalla certè non ex omni numero forent nec vocari poſſent Metalla, quia in omnibus relationibus & commixtionibus cum aliis rebus, in ſolutionibus, præcipitationibus, ſublimationibus, &c. inter ſe non conveniunt. Et quidem differere poſſet:

a. Aurum exiſtimo pro vero Metallo, eam ob rationem, quia in Aqua regis ſolvitur; cum verò Argentum in Aqua regia non diſſolvi poteſt, ergo hoc non eſt Metallum.

b. Vicê verſâ Argentum atque alia quædam Metalla in Aqua forti ſolubilia pro veris Metallis, habere, Aurum vero ex Metallorum numero excludere poſſet, quia hoc nullam in Aqua fortę ſolutionem admittit. Spiritus Vitrioli diſſolvit ferrum & cuprum, non verò Aurum nec Argentum, proindè duo hæc nobiliora Metalla non eſſent Metalla.

Hoc idem illud eſt Argumentum, quale D. Brown, ratione ſolubilitatis, pag. 363, ſub N° 3, circa Camphoram Thymi adducit, dicens: Oleum Vitrioli ſolvit quidem Camphoram communem, non verò Camphoram Thymi, ergo Præparatum hoc Thymi nulla eſt Camphora.

2. Secundò objectionem ipſe formare poſſet, ratione coloris & conſiſtentiæ differentis in ſolutionibus Spiritus Nitri enim hoc vel illud Metallum ſolvit colore albo, ſolutio pellucida apparet & clara; quia verò ſolutio Veneris eſt cæruleo-viridis, ſolutio Martis valde obſcure-rubro-fuſca & ſolutio Stanni non penitus & ubique pellucida hæque poſteriores longe aliter ac ſolutio Lunæ puræ, Mercurij, &c. ſeſe habent; ergo has planè aliter viſui ſeſe ſiſtentes craſſiores & ex parte haud pellucidas ſolutiones non eſſe ſolutiones Metallorum, vel ſolutas materias non eſſe Metalla.

Ita enim D. Brown, Pag. 362, ſub N° 2. de ſolutione Camphoræ Thymi in Spiritu Nitri iterum concludit: quia nempè ſolutio Camphoræ Thymi eundem calorem, conſiſtentiam ſeu pelluciditatem non poſſidet, uti Solutio Camphoræ communis; ergo Camphora Thymi non eſt Camphora, cum tamen hîc perpendere debuiſſet, quod primo ipſe Spiritus Nitri, ratione coloris & pelluciditatis, in quibuſdam Metallis

tallis alios colores producat ac multiplices variationes inferat ; ſecundò, cum hîc Camphora Thymi ex Oleo rubro-fuſco orta, adhæc cum partibus oleoſis quaſi ſuper-ſaturata ſit, quod indè quoque facillimo negotio longè obſcurior & craſſior ſolutio produci queat.

Sect. XIX.

3. Ratione præcipitationis vel reliquarum relationum harum ſolutionum etiam per ſe, D. Brown non pauca objicere poſſet, dum circa eas multò plures differentiæ occurrunt, quam inter duas haſce Camphoras :

a. Ratione ulterioris relationis ſolutionum Metallorum obtendere quis poſſet : Solutio Argenti, Plumbi & Mercurij in Spiritu Nitri veras præbet Cryſtallos, è contrario ſolutio Martis & Stanni cum Spiritu Nitri nullas ſiſtit ; ergo hæc poſteriora non ſunt Metalla, ſed tantum priora. Solutio Mercurij in acido concentrato ſalis communis per ſublimationem largitur Sal Cryſtallinum, reliqua Metalla omnia non ita ; ergo Mercurius ſolus eſt Metallum. Quædam Metalla ſub ſolutionibus fortem vaporem emittunt, alia non item. Quædam ſub Solutione per ſe aliquid ad fundum dejiciunt, alia non ; ergo quædam tantum ſunt Metalla excluſis reliquis.

b. Ratione præcipitationis non parvus differentiarum numerus, quæ ſub Metallicis ſolutionibus ſeſe exſerunt, ſi prolixior eſſe vellem, adduci poſſet, dum ſcilicet Metallum ſolutum in præcipitatione mox ut calcem puram Metallicam præcipitamus, mox autem planè alias omnique Metallico ſplendore orba-

tas calces, ex parte etiam difficulter reducibilia præcipitata nanciſcimur. Quis verò propterea de his poſterioribus affirmare auderet, materias iſtas, è quibus iſtiuſmodi calces provenerunt, non eſſe Metalla, quia in præcipitatione non eôdem cum illis modô ſeſe haberent, vel quia non ut perfectè nitida ac ſplendeſcentia Metalla ſeſe rurſus præcipitarent? Nihilo tamen minus D. Brown circa Camphoram ejuſque diverſas præcipitationes & relationes, quod nempè ſolutio Camphoræ Thymi eôdem modô ſe non præcipitet ac ſolutio Camphoræ vulgaris, eandem dénuò format concluſionem: Ergo Camphora Thymi non eſt Species Camphoræ, vel propterea in id genus Mixtorum non pertinet. Reperiuntur ejuſmodi differentiæ etiam in variis tractationibus, ſolutionibus & præcipitationibus corporum reſinoſorum cum Spiritu Vini, quinimo ex quibuſdam ſolutionibus reſinoſis, curioſitatis gratia, duplicis generis præcipitationes, ſi cuidam fucum facere velles, monſtrari poſſunt, ita ut reſina vel ſtatim ſe præcipitet & ad fundum ſeparetur, vel etiam ſolutio minus rectè ſe præcipitet, ſed turbida tantum ac lacteſcens fiat, idque eâdem ſolutione, eôdem ſolvente, eôdemque præcipitante: Ex qua verò lacteſcente præcipitatione concluſio formari nondum poteſt, quod ſubſtantia ſoluta non fuerit vera reſina.

Sect. XX.

B. Sub copulationibus, ſolutionibus, Præcipitationibus, ſublimationibus & Cryſtalliſationibus Salium innumeræ ferè differentiæ & per quam diverſæ relationes occurrunt, quæ maximoperè ſæpius, uti dies

dies & nox ſeſe diſtinguunt vel ſibi invicem plane contrariantur. Quantopere enim ſola Salia acida à ſe invicem differunt; & ſic etiam, quando ea cum Sale alcalino vel fixo vel volatili conjuncta & in ſtatum neutrum redacta ſunt? Pergrandem illam differentiam Salia inter acida & alcalica vel ipſimet norunt tirones; quis verò idcirco, novô plane modô, & N. B. propter has mox hîc mox illic occurrentes differentias, vel quia in omnibus partibus ac relationibus inter ſe non conveniunt, talem concluſionem formare auderet: Ergo hoc vel illud non eſt Sal? Ratio, quia vel planè nullam Cryſtalliſationem admittit, vel non eâdem figurâ, uti illud Sal, cryſtalliſatur, vel quia ſublimationem reſpuit, aut in commixtione cum hac vel illa materia non eôdem modô, uti illud Sal, ſeſe gerit, vel quia aliter ſeſe præcipitat, non plenariè reducitur, aut ſiccam conſiſtentiam recipere recuſat, & quæ fortè centenæ pluresque variationes circa phyſico-chemica experimenta, quibus Salia intermixta ſunt, reverâ occurrentes adduci poſſent.

Sed ejuſmodi ratiocinandi modus hactenus uſu nondum eſt receptus.

Sect. XXI.

Jam verò Camphora Thymi, 9 vel 10 cum communi Camphora perfectè convenientes, adeóque præcipuas Camphoræ proprietates poſſidet, ſicut ſuprà demonſtravi, quas nec ipſe D. Collega meus negare poterit nec audebit, & ratione cujus conditionis nulla certè mihi in Orbe cognita eſt materia,

qua cum hoc album, ſolidum, pellucidum, fragrans, inflammabile, pulchrè cryſtallinum corpus rectius comparare poſſem, quam unicè ac ſolùm cum Camphora. Sic etiam Plumbum, Ferrum, Cuprum & Stannum ad nihil præſtantius quam ad Metallorum Ordinem; Vitriolum, Sal commune, Alumen & Nitrum ad nihil aliud quam ad Salium ordinem recipi poſſunt, quia notabiliores proprietates eorum requiſitas poſſident, ac cum nulla alia re magis, quam cum iis conveniunt. Nihilo tamen minus (juxta D. Brown circa Camphoram Thymi argumentandi methodum) hic itidem objici poſſet: Plumbum, Ferrum, Cuprum & Stannum non eſſe Metalla, ex ea ratione, quia in igne non adeò ſint conſtantia uti Aurum & Argentum, ſed comburantur in calcem, exhalent ex parte in auras & ſub ſolutione, præcipitatione, ſublimatione, &c. aliô modô ſeſe habeant; Vitriolum, Sal commune, Alumen & Nitrum non eſſe Salia, quia à puro Sale acido vel alcalino, vel Sale ammoniacali ſublimabili, & vicê verſâ valdè differant, ut differentias plures notabiles, quæ in copia adduci poſſent, taceam. Quis verò hoc in gratiam alterius crederet? Siquidem dubito, quin ipſe D. Brown hoc credat, ſed potius ſatis cognitum habeat. Si autem novit ac firmiter credit, quatuor iſtas antedictas Regni mineralis ſubſtantias eſſe Metalla, nullique rei melius annumerari poſſe, adeóque hoc nomen de jure mereri, licet ab auro & argento multum diſcrepent; Porrò, quod reliquæ, exempli tantum gratia, adductæ ſubſtantiæ Salinæ ſint vera Salia, quamvis nec pura Salia acida nec alcalica exiſtant, & tam inter ſe, quam etiam à multis aliis Salibus valde differant; quare igitur in Regno

Vege-

Vegetabili, vel hîc circa noſtrum Concretum Oleoſo-cryſtallinum, propter proprietates & differentias quaſdam particulares, novum concludendi ac deſcribendi modum injicit, & Camphoram Thymi, tantummodò propter aliquas cum vulgari Camphora differentias, vel quia illa in omnibus ulterioribus relationibus cum hac non conveniat, pro Camphora agnoſcere, declarare & ſic nominare recuſat? Cum tamen hoc Thymi concretum, quoad proprietates principales, tam benè cum Orientali Camphora ſymbolizet, ac Metalla prædicta cum aliis Metallis, vel Salia iſta cum aliis Salibus. Quod ſi Plumbum, Stannum, Cuprum & Ferrum Metallum appellare licitum eſt, quamvis ab Auro & Argento, imo inter ſe, multum differant; quod ſi Alumen & Vitriolum Sal vocitare ſolemus, licet à Sale communi aliiſque Salibus multum diſcrepent; quare non licitum mihi fuerit, cryſtallinum hoc corpus Camphoræ nomine inſignire, etiamſi quaſdam à vulgari Camphora obtineat differentias? Videtur mihi, Viros neutri parti addictos meam potius Opinionem approbaturos, eamque magis appropriatam & adæquatam judicaturos eſſe, quam Titulum Olei, vel ut ſolidum, pellucidè-cryſtallinum, ſiccum corpus appelletur Oleum.

Sect. XXII.

Concluſionis loco adhuc ſemel ergo repeto:

1. Quamdiu aliquid Olei nomen meretur, tamdiu vel planè liquidum, vel ſaltem craſſiuſculè liquidum, unctuoſum & pingue tactu illud eſſe debet.

2. Quamdiu aliquid pro Oleo coagulato vel condenſato habere poſſum, tamdiu neceſſe eſt ut craſſiuſculum, parum vel planè non liquidum, vel ad ſummum unguenti & ſebi conſiſtentiâ, idque ſolummodo in frigido, adeóque obrigeſcens ſit, attactu tamen nihilominus digitos pinguefaciat &, leviſſimo quoque adhibito calore, formam iſtam coagulatam iterum amittat.

3. Simulac autem verè ſiccas, ſolidas & pellucidas (in forma circiter pulchri & clari Tartari vitriolati cryſtalliſati apparentes) cryſtallos nanciſcor, etiamſi ex ipſo Oleo ortæ ſint, imo licet etiam in ſua mixtione, pro maximo pondere, ex veris oleoſis partibus conſiſtant, attamen ſtatim ceſſat titulus Olei, & cognomen hoc coagulati ſeu condenſati Titulum Olei amplius tueri non valet; nec neceſſe eſt cognomina talia adhibere, dum, ſi ejuſmodi ex Oleo eſſentiali productum cryſtallinum, ſiccum corpus exiſtit, quale ſubſtantiam quæſtionis videmus, unicum verbum Camphora tum ſatis ſufficiat, adeóque optimè exprimat, quale ſit mixtum, & quod nihil aliud, quam Species Camphoræ, ſicque corpus noſtrum cryſtalliforme Camphora Thymi maneat.

P. S. Sphalmata & Errata ſcriptoria vel typographica, dum in Obſervatione mea pag. 324. lin. 2 & 3, vel Amanuenſis meus literam *a* ſupernè non ſatis debitè contraxit, quam poſteà Typotheta pro *u* aſſumſit, vel Typotheta *u*, loco *a*, arripuit, adeóque loco veram, denſam, verum, denſum impreſſit, D. Brown pro eo, quo pollet, judicio, facilè agnoſcere potuiſſet, neque eoſdem errores eiſdem typis denuò excudendos curare opus habuiſſet. Ego certè

vitio

vitio mihi verterem, ſi ex Obſervatione ipſius pag. 300. lin. 4. ab ima pagina verbum *Diſſerentiis*, pag. 364. lin. 2. *Philoſoſophicis*, item, pag. 365. lin. 16. verbum *nalis* & ejuſmodi facilè evenientia Sphalmata ſcriptoria vel typographica, quæ aliàs Viri graves omnium Nationum facili negotio perſpicere, indulgere & excuſare ſolent, ei exprobrare vel eôdem modô typis viciſſim mandare vellem.

Berolini, d. v.
Martij, 1731.

CASPAR NEUMANN.
Med. D. & Chemiæ Prof.

In Epiſtola ad illuſtriſſimum R. S. Præſidem *data* Berolini *a. d.* III. *Id.* April. CIↃ IↃ CC XXXIII. *breviter ſcribit Doctiſſimus Author noſter hiſce verbis.*

" DE Diſſertatione mea ſecunda de *Camphora*
" *Thymi* id quidem ingenue profiteor, nihil
" me aliud denuo declarare voluiſſe, niſi hoc ipſum,
" quod materia, quæ in duris cryſtallis atque in aqua
" non ſolubilis comparet in Oleo Thymi pariter at-
" que aliis quibuſdam Oleis eſſentialibus, minime Sal
" aliquod volatile, multo minus Oleum coagulatum,
" ſed ſingulare quoddam, ex iſtiuſmodi Oleis ſegre-
" gatum ſeparatumque concretum, & ut paucis di-
" cam, ejuſmodi mixtum ſit, quod me quidem ju-
" dice non alio magis convenienti quam *Camphoræ*
" nomine inſignire poſſis.

Garcinia Mangostana L.

III. *The Settling of a new* Genus *of* Plants, *called after the* Malayans, MANGOSTANS; *By* Laurentius Garcin, *M. D. and F. R. S. Tranſlated from the* French *by Mr.* Zollman, *F. R. S.*

THE *Mangoſtans* is akind of Pomiferous Tree, which grows in the *Molucca* Iſlands, the Fruit of which is one of the beſt in the World for eating.

Its CHARACTER.

This *Genus* has its Flower compleat, tetrapetalous, regular, hermaphrodite, containing the *Ovary*. Its *Calix* is monopetalous, divided into four Lobes, roundiſh on the Edges, and hollowed in the Shape of a Spoon. The *Ovary* is very near cylindrical, with a Tube upon it cut out in the Shape of a Roſe, which covers it like a little Cap. The *Stamina* which ſurround it, are ſpherical at the Top, their Number is four times that of the *Petala*. When theſe are gone off, the *Piſtil* changes into a round Fruit, adorned with its *Calix*, and its Tube, cut into the Shape of a Star with Rays ſquared at the Corners. Its *Cortex*, which is thick and brittle, encloſes a Cavity filled with as many pulpous and juicy Segments as there are Rays in the Tube. Theſe Segments are white, in the Shape of a Half-moon, ſticking together, and containing each but one Grain of Seed; which

which latter is oblong, ſomething flattened, reſembling an Almond, wrapt up in a *Tunica*, which is covered with a hairy Coat of Fibres or Veſſels, which together with the Pulp make up the *Parenchyma* of a Segment of the Fruit. The Leaves of the Tree are entire, ſmooth like thoſe of the *Laurel*, and grow oppoſite to each other on the Branches. The Stem of the Tree grows up ſtraight to the Top of its Tuft, and its Branches and Twigs come out oppoſite to one another like the Leaves.

I know but one Species of this *Genus*, which admits indeed of ſome Variation, but without any other Mark than what appears in the Fruit.

Mangoſtans Garciæ, Cluſ. Bont. *Arbor peregrina Aurantio ſimili fructu. Cluſ. exot.* 12. *Laurifolia Javanenſis C. B. Pin.* 461.

Its DESCRIPTION.

The *Mangoſtans* is a Tree of a very moderate Size. It does not grow above three Toiſes (about eighteen Feet) high. Its Stem runs up ſtraight to the Top of its Tuft, like the Fir. This Tuft is regular, in Form of an oblong Cone, compoſed of many Branches and Twigs, ſpreading out equally on all Sides, without leaving any Hollow.

The Stem grows at Bottom to the Thickneſs of a Man's Thigh, or about eight or ten Inches in Diameter; it afterwards diminiſhes in Thickneſs by Degrees up to the Tuft. Its Wood is white, as long as the Tree is growing, but browniſh when the Tree is cut down and dry. Its Bark is a little tender, and ſeparates eaſily from the Wood; it is of a dark

Grey Colour, and ſlit, or full of Cracks up the Stem, but on the Twigs it is more even and greener, reſembling that of *Evonymus*, or Spindle-Tree.

The Branches grow out of them by Stories, and oppoſite to one another; thoſe Stories croſs each other obliquely, and not at right Angles. The Thickneſs of thoſe Branches is always proportionable to that of the Stem at the Place where they come out of it: This Proportion is about one to four, or one to five. The Length of the inferior Branches of the Tuft is of five or ſix Feet, the others ſhorten as they come near the Top. The Diſtances of the Stories of the Branches are a little unequal, but where they are wideſt, they do not exceed the Length of the greateſt Leaves, that is, eight or nine Inches.

The Twigs grow on the Branches in the ſame Order as thoſe do on the Stem, that is, oppoſite to each other. The longeſt are commonly of the Length from one's Hand to the Elbow. The greater Twigs grow out to a certain Diſtance from the Stem, and the others which garniſh the reſt of the Branches, always grow leſs and leſs towards their Extremity.

The Branches and Twigs never divide themſelves.

The Leaves are large, entire, beautiful, ſmooth, of a ſhining Green on the upper Side, and of an Olive Colour on the Back, pointed at their Extremities. The Rib which divides its Extent into two equal Parts, is ſtraight, and equally prominent on both Sides. From the Sides of this Rib there iſſue forth Fibres pretty ſmall, and almoſt by Pairs, which extend themſelves in Parallels, and bent a little Archwiſe quite to the Edge of the Leaf, where they unite

unite themſelves into a Thread, which forms there a kind of Margin. The Maſhes, or Filaments of the Net are not very perceptible. The Size of theſe Leaves varies; the largeſt are eight or nine Inches long, but commonly ſeven. The Breadth of each Leaf is near equal to half its Length, which Proportion is always the ſame in every Leaf. Their Pedicles are thick, ſhort and wrinkled, flat on the Inſide, and raiſed in the Shape of an Aſs's Back on the Outſide, moſt frequently half an Inch long. They come out near, and on the Extremities of the Twigs, oppoſite to each other like the Branches themſelves. There appear ſeldom above two Pairs of Leaves on each Twig, and thoſe that ſhoot out laſt always make up the Extremity of that Twig.

The Flower is of two Inches in Diameter, pretty much like a ſingle Roſe. It is compoſed of four *Petala*, almoſt round, or a little pointed, of the Breadth of an Inch, or thereabouts, very thick, firm, fleſhy, brittle, and ſomewhat hollowed into the Shape of a Spoon. Their greateſt Thickneſs is near their Baſis, of above a Line, which decreaſes by Degrees towards the Extremity. They entirely reſemble the *Petal* of a Roſe, except that inſtead of being indented like a Heart, they end gradually into roundiſh Points (as I ſaid before). Their Colour is alſo like that of a Roſe, except that it is deeper and leſs lively. The Baſis, which is the thickeſt and firmeſt Part of it, is the whiteſt, and the moſt brittle.

The Piſtil, or *Ovary*, is a round or almoſt cylindrical Body, five Lines thick, raiſed to the Height of four. The upper Part of this Piſtil, that is to ſay, its Tube, is cut in the Shape of a ſmall Roſe, covering

ing the *Ovary* like a Cap. The Diameter of this Cap is of an equal Breadth with the *Ovary*, which it covers entirely, ſticking very cloſe to it. The Colour of the *Ovary* is a pale or whitiſh Green, and that of the Tube a White that is ſullied or dirty.

The *Stamina* riſe from the Baſe of the *Piſtil*, they are whitiſh, round at the Tops, and raiſed to the Circumference of the Tube, applying themſelves to the *Ovary*. They are ſixteen in Number; four for each *Petal*.

The *Calix* is of one Piece, expanded and cut into four Lobes down to its Baſis. Theſe Lobes are thick, round, ſkinny, hollowed in the manner of a Spoon, reſembling alſo *Petala* of Roſes not fully blown. They ſeem to croſs one another like the *Petala*. The two upper Lobes are ſomething larger than the lower ones; they are greeniſh on the outſide, and of a fine deep Red within, which makes them more agreeable to the Eye than the *Petala*; the Red of the upper ones is more lively than that of the lower ones. All theſe Lobes in ſhort are hollower than the *Petala*; they do not cover thoſe latter farther than half way their Height. This *Calix* encloſes all the Parts of the Flower. It is ſupported by a Pedicle of ſeven or eight Lines long, its thickneſs being commonly of one third of its Length. This Pedicle is green, and conſtantly comes out of the End of a Twig above the laſt Pair of Leaves.

The Fruit is round, of the Size of a middling Orange: Its Bigneſs however varies very much, from one Inch and a half to two Inches and a half in Diameter. The Top of it is covered with a Sort of Cap embоſſed, cut out in the Shape of a Roſe, or a Star with

Rays ſquared off, of a Finger's Breadth, or ſometimes of an Inch in Diameter. The Rays of this little Roſe are moſt frequently ſix or ſeven in Number, but ſeldom of five or eight. Theſe Rays, by being thus ſquared, form together a kind of *Polygon*: This is the Part which had ſerved for the *Tube* to the *Ovary*.

The Body of this Fruit is a *Capſula* of one Cavity, compoſed of a thick Shell, brittle, a little like that of a *Pomegranate*, but ſofter, thicker, and fuller of Juice. Its Thickneſs is commonly of three Lines: Its outer Colour is of a dark-brown Purple, mixed with a little Grey and dark Green; the inner Colour, that is to ſay, on the inſide of the Caſe, is of a Roſe Colour. Its Juice is purple. Laſt of all this Skin is of a ſtyptick or aſtringent Taſte, like that of the *Pomegranate*; nor does it ſtick to the Parts of the Fruit it contains. The inner Part of this Fruit is a furrowed Globe divided into Segments, much like thoſe in an Orange, but unequal in Size, which do not adhere to each other. The Number of theſe Segments is always equal to that of the Rays of the Tube which covers the Fruit. The fewer there are of theſe Segments, the bigger they are. There are often in the ſame Fruit Segments as big again as any of thoſe that are on the Side of them: Which will be eaſily ſeen in the Figure I have given of it.

Theſe Segments are white, a little tranſparent, fleſhy, membranous, fibrous, full of Juice like Cherries or Rasberries, of a Taſte of Strawberries and Grapes together. Each of the largeſt Segments encloſes a Grain of Seed of the Figure and Size of an Almond ſtripp'd of its Shell, having a Protuberance on one of its Sides, which is nothing elſe but its Navel.

Navel. This Grain is covered with two ſmall Skins, the outermoſt of which ſerves for a Baſis to the Filaments and Membranes of which the Pulp is compoſed. The Subſtance of theſe Grains comes very near to that of Cheſnuts as to their Conſiſtency, Colour, and aſtringent Quality. The *Calix* always remains ſticking to the Fruit, to which it ſerves for an Ornament, and when half dried up, it is of the Colour of the *Pomegranate* Shell on the Outſide. It covers about a ſixth Part of the Circumference of the Fruit.

REMARKS.

Garcias, *Cluſius*, and *Bontius*, are the firſt Authors who have made mention of the *Mangoſtans*; but they have left us only indifferent Deſcriptions, and ſo ſhort ones, that it is not poſſible to form from them a ſufficient Idea for diſcovering its Characters. The firſt of thoſe Authors was ill informed, when he was told the Fruit of it was yellow. *Cluſius* has ſpoke of it under two different Names, without apprehending that it was one and the ſame Plant. The Figure which he has given of the Fruit, and which he calls *Arbor peregrina Aurantio ſimili fructu*, though ill done, yet repreſents it enough to know it again. If in that Figure the Fruit appears little in relation to the Twig which ſupports it, this can be for no other Reaſon, but becauſe he received from the *Indies* ſome of that Fruit which had been gathered before its State of Perfection, and after it drew his Figure. And hence it is, that the Fruit being ſhrunk up and imperfect, he found nothing in

it but a few ſhrivell'd Grains, which were not much larger than thoſe of a *Fig*.

It is ſurpriſing however, that the moſt delicious Fruit of all the *Indies*, and which yields to none of the beſt in *Europe*, is that which of all has been hitherto leaſt known. But as I have often eaten of it, and found it as excellent as it is reputed in the Countries where it is cultivated, I reſolved to examine its Genus, to ſettle its Characters, and to give a Deſcription of it, which might make it better known for the future to Botaniſts, and other curious Perſons.

This Tree originally grows in the *Molucca* Iſlands, but for ſome Years paſt it has been tranſplanted into the Iſle of *Java*, and ſome few at *Malacca*, in which Places it thrives very well. Its Tuft is ſo fine, ſo regular, ſo equal, and the Appearance of its Leaves ſo beautiful, that it is at preſent looked upon at *Batavia* as the moſt proper for adorning a Garden, and affording an agreeable Shade; yet there have been but few *Europeans* in the *Indies* who have made uſe of it for this Purpoſe, becauſe they were unacquainted with it. They employed other Trees which did not near come up to it as to Uſefulneſs and Beauty.

Travellers who make mention of its Fruit, always ſpeak of it with great Encomiums. *Linſchooten* is the only one who, after having given a Deſcription of ſeveral *Indian* Fruits in his own way, thought it needleſs to deſcribe the *Mangoſtans*, as well as ſome others, becauſe, ſays he, they are little valued. Probably he never ſaw it, but upon Enquiry took upon Credit what ſome Perſon or other told him, who

knew nothing of it beſides the Name, and confounded it with others which are little eſteemed.

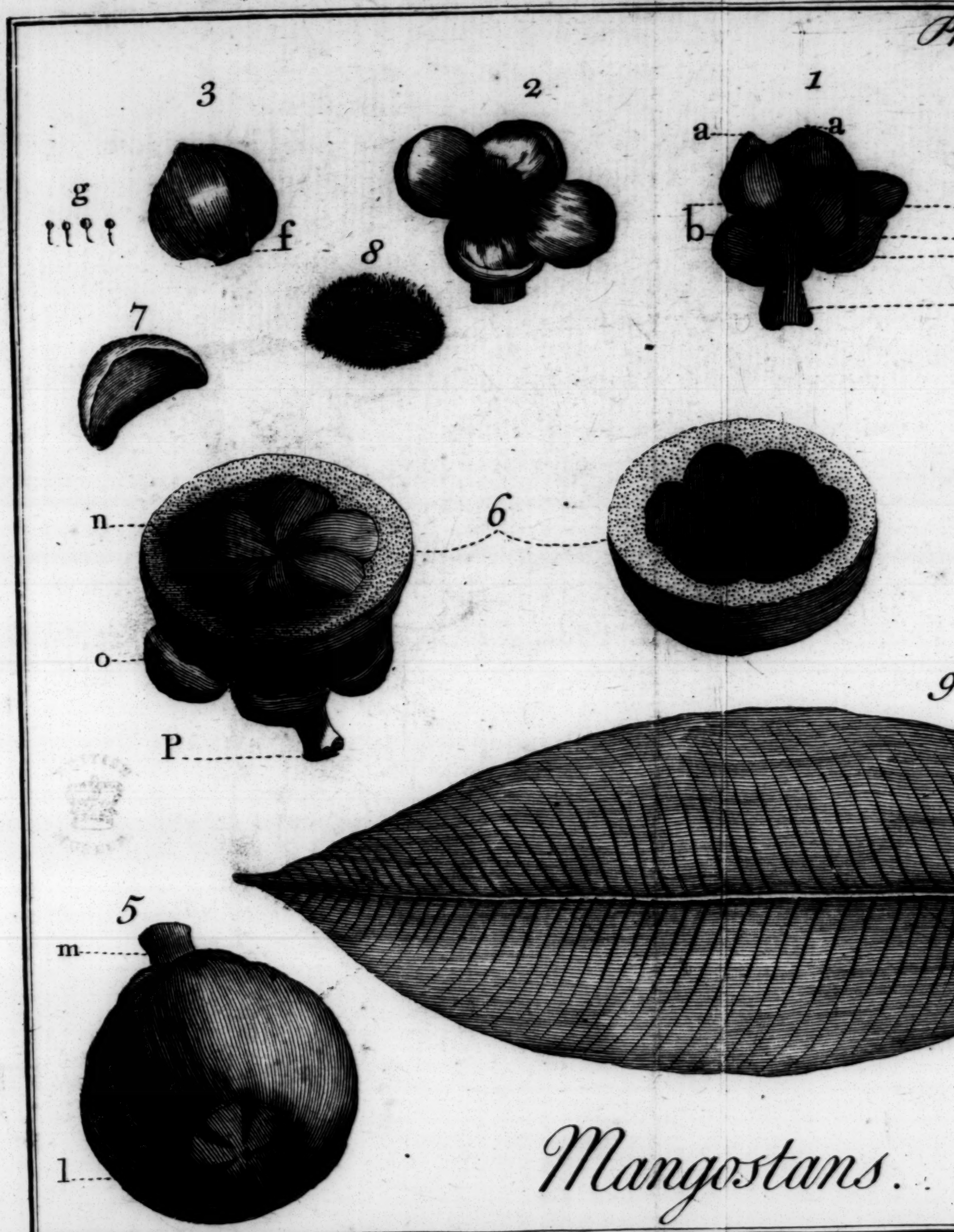
There are few Grains to be met with in this Fruit that are good for planting, for moſt of them are but abortive.

Sometimes this Fruit is found ſpoiled within, which may be known by yellow Spots appearing on ſome of the Segments. Some People ſcruple then to eat them, but others make no Difficulty about it. It is certain however, that they are not ſo good, eſpecially if the Spots are conſiderable. I obſerved that this Corruption proceeded from the Juice in the *Capſula*, which being ſpoiled by the Sting of ſome Inſect, and thereby becoming yellow, and ſpreading over the Segments of the Fruit, infected them with that Colour, and thereby changed them. This Wound is ſo ſmall, and ſo hard to be diſcovered, that one often is left in a Doubt whether there be any at all.

One may eat a great deal of this Fruit without any Inconvenience, and it is the only one which ſick People may be allowed to eat without any Scruple. It is very wholſome, refreſhing, and more cordial than the Strawberry.

Its Shell has the ſame Virtue as that of the *Pomegranate*; at *Batavia* they make an Infuſion and a Tincture of it againſt Looſeneſſes, and chiefly againſt Dyſenteries. The Wood is good for nothing but firing.

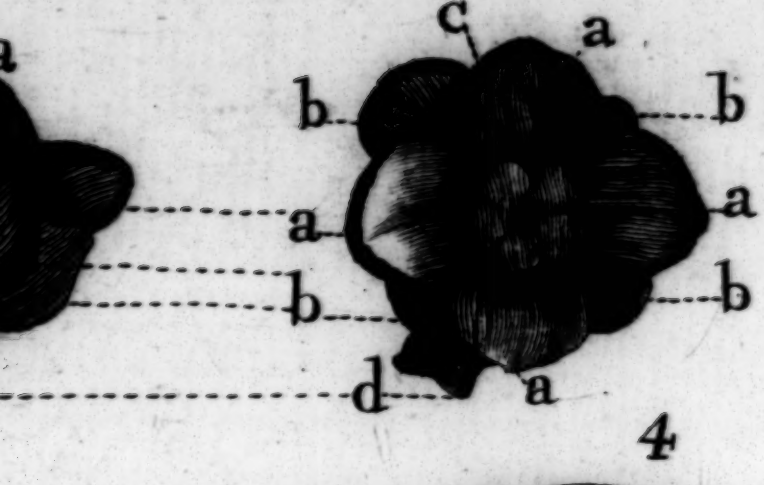
In the *Memoires de Mathematique & de Phyſique de l'Academie Royale des Sciences de Paris*, of the Year 1692, Page 435 of the *Amſterdam* Edition, there is a ſhort Deſcription of the *Mangoſtans* by



Mangostans..

Philosoph: Transact: N.° 431.

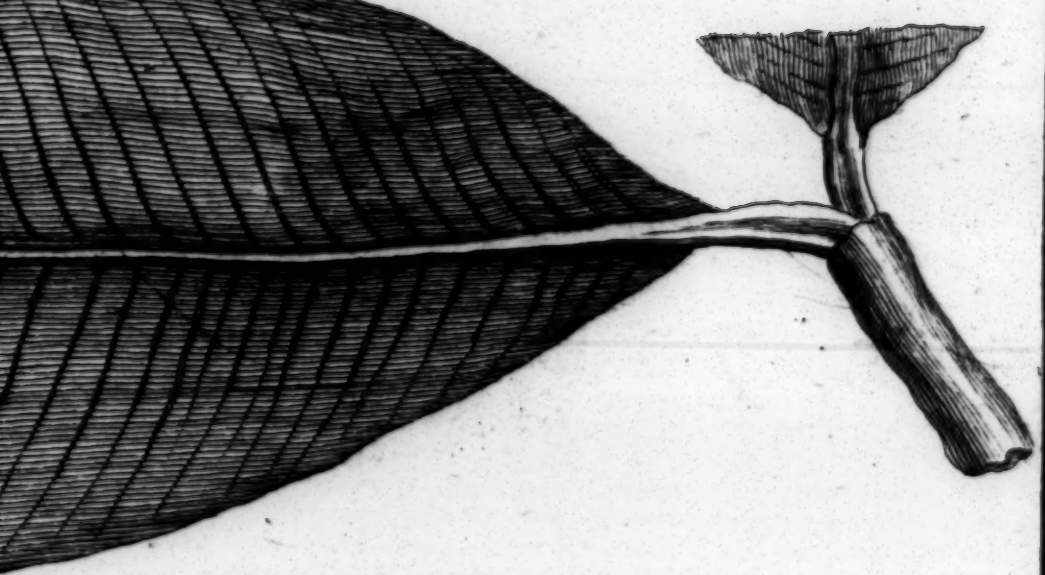
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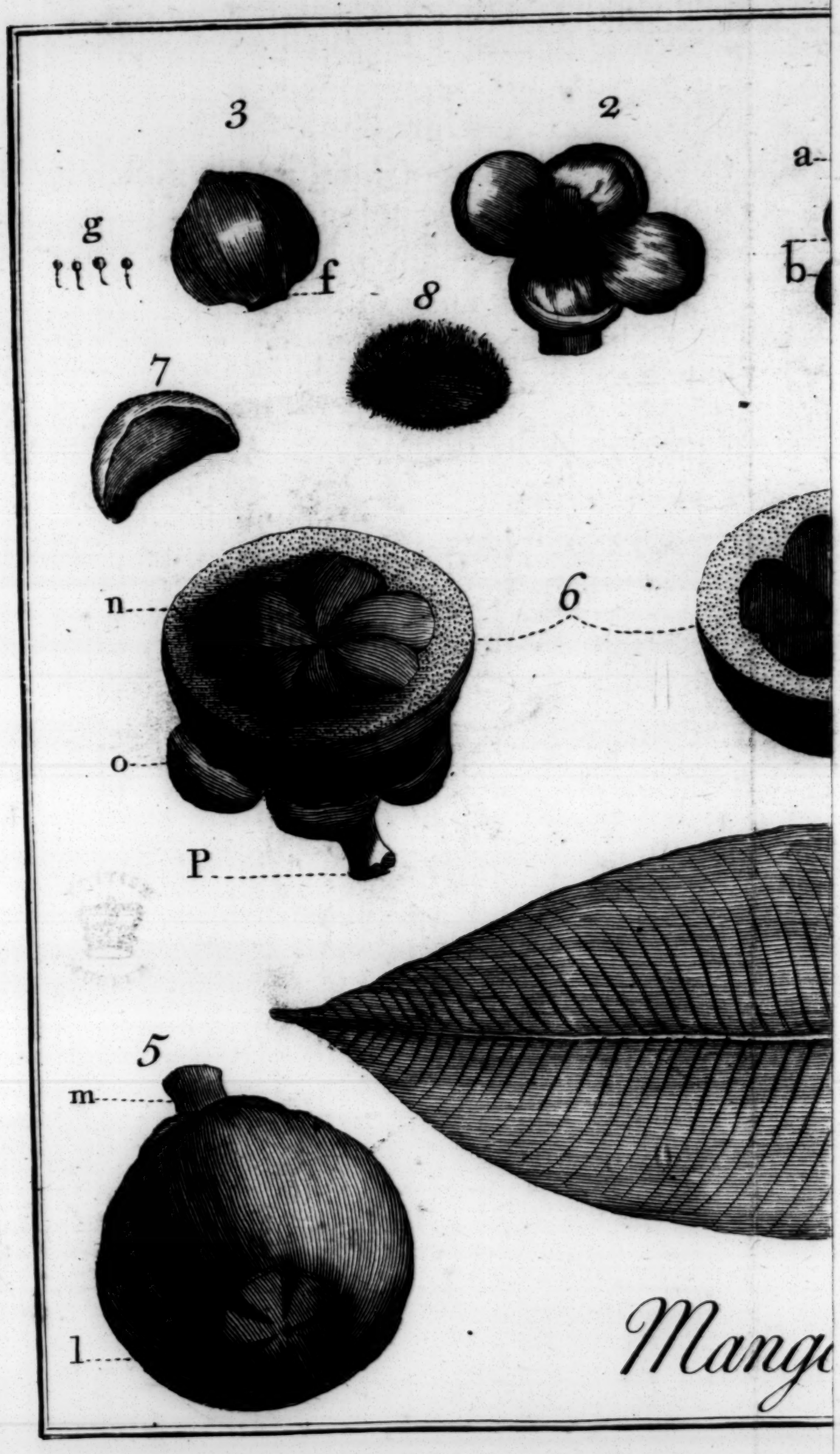


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S.

J. Mynde sculp.



Mang

by Father *Beze*, which is pretty good; but as he took the *Calix* for the Flower, it is plain he obſerved it not 'till after the *Petala* were fallen off. His Deſcription is too ſhort and defective for determining from thence alone the true Characters of this Genus.

EXPLANATION *of the* FIGURES.

Fig. 1. The Flower, as it appears in the Inſide and Outſide.

a. The four *Petala* of the Flower.
b. The four Lobes of the *Calix*.
c. The Tube.
d. The *Pedicle*.

Fig. 2. The *Calix* as it appears in the Inſide with the *Piſtil* and the *Stamina*:

e. The End of the Pedicle of the Flower, which ſupports the *Calix*.

Fig. 3. A *Petal*, as it appears on the Back, ſeparated from the Flower:

f. Its Baſis, which is the thickeſt, the firmeſt and the moſt brittle Part.
g. Four *Stamina* belonging to the *Petal*, ariſing from the Baſis of it, and of the *Piſtil*.

Fig. 4. The entire Fruit ſeen from the Side of the *Calix* or the *Pedicle*.

h. The *Calix*.
i. The *Pedicle*.
k. A Part of its Tube.

Fig. 5. The ſame, ſeen from the Side of the Tube, which is cut out in the Shape of a ſmall Roſe:

l. The Tube, which always ſticks faſt to the Fruit.

m. The *Pedicle*, and Part of the *Calix*.

Fig. 6. The Fruit cut into two Halfs, containing ſix Segments:

n. The Segments good to eat, whereof ſome commonly are larger than the others.

o. The *Calix*.

p. The *Reditle*.

Fig. 7. A ſeparate Segment of the Fruit, in the Shape of a Half-moon, containing a Grain.

Fig. 8. A Grain or Seed ſeparated from the Segment, the Coat whereof is covered with Filaments, which formed the *Parenchyma* of the Segment.

Fig. 9. A Leaf of the Tree which bears the *Mangoſtans*, with its Fellow cut off near the Bottom, ſupported by a Piece of its Twig.

IV. *An*

IV. *An Account, by Mr.* John Eames, *F. R. S. of a Book entitled,* TRAITE PHYSIQUE ET HISTORIQUE DE L'AURORE BOREALE, Par Mr. DE MAIRAN. Suite des Memoires de l'Academie Royale des Sciences, Année MDCCXXXI: *Or, a Philoſophical and Hiſtorical Treatiſe concerning the* Aurora Borealis; *By Mr.* De Mairan, *being a Supplement to the Memoires of the Academy of Sciences for the Year* 1731.

THE frequent Appearances of the *Northern Lights* in ſeveral Parts of *Europe* and *America*, and the ſurpriſingly beautiful *Phænomena* that have been obſerved in ſome of them, ſuch as the Rainbow-Colours, Canopy, *&c.* have very juſtly engaged the Philoſophers of the preſent Age in a Search after the Cauſes of them. Several Hypotheſes have been invented and propoſed by the Learned, in order to explain theſe things. Moſt of them ſuppoſe theſe *Phoſphorus* like Appearances to proceed from certain *Effluvia*, either perſpired out of our Earth, or at leaſt paſſing through it. But our ingenious Author has thought of a Cauſe very diſtant, as well as very different from all theſe, *viz.* the Atmoſphere of the Sun, which at ſome times ſhews itſelf under the Appearance of a Light, which he calls the Zodiacal Light, but at other times produces an *Aurora Borealis.*

alis. The Zodiacal Light is the purer unmixed Atmoſphere of the Sun: But an *Aurora Borealis* is the Effect of the Solar Atmoſphere, conſequent upon its making a Deſcent into, and blending itſelf with the Atmoſphere of our Earth, at certain Times and Seaſons of the Year. But a more particular Account of this Matter will be given hereafter.

The learned Author of this Work has taken a great deal of Pains in compiling it. He has look'd over the Accounts of Meteors, from the fifth Century down to the preſent Time, in the Hiſtorical Part; and has ranged them in very good Order, in regard of the ſeveral Returns of this *Phænomenon*, making ſuch Remarks by the way, as ſerve to ſupport his Solution of it in the Philoſophical Part.

By a Return he does not mean barely a ſingle Appearance, but a Series of them after a Ceſſation or Non-appearance for ſeveral Years. Thus he makes but twenty-two Returns from the Year 400 to 1716, while the ſeveral Appearances of theſe Lights from 1707 to 1710, after a ceaſing to be ſeen for twenty Years, are reckoned but one Return.

Mr. *Mairan* hopes the learned World will take the whole Performance under their Conſideration, and give their free Thoughts upon it.

The Work conſiſts of five Sections; the firſt gives a ſhort Hiſtory of the Zodiacal Light. In the ſecond he treats at large of the Atmoſphere of the Earth; its Altitude, and the Height of the *Aurora Borealis* in it, and the Excluſion this Circumſtance gives to ſome of the Cauſes, which have been already aſſign'd, of this *Phænomenon*. In the third he propoſes the Cauſe, and accounts for the Formation

tion of this Appearance in general, and then deſcends to a Detail of the ſeveral Particulars, adding the Solution of each. The next Section is employed in relating the Hiſtorical Proofs of his Hypotheſis concerning the *Northern Lights*, taken from the Records we have of ſeveral Appearances of thoſe Lights, to be met with in ancient Authors, compared with thoſe of the Zodiacal Light, their ſuppoſed Cauſe, and the Situation of the Earth in her annual Orbit at thoſe times. The laſt Section conſiſts of twenty-eight curious Queſtions concerning ſeveral other *Phænomena* of Nature, which the ingenious Theoriſt believes to have a Dependance upon his new Hypotheſis, and explicable by it.

But a more particular Account of theſe Matters may juſtly be expected.

Mr. *Mairan* begins the whole with laying before the Reader a ſhort View of his Hypotheſis concerning the Nature of an *Aurora Borealis*, defining his Terms as he goes along.

The *Aurora Borealis*, ſays he, is a luminous *Phænomenon*, ſo called from the Place of its Appearance, uſually in the Northern Parts of the Heavens, and with a Light near the Horizon, reſembling that of the Morning Dawn. This Name is ſuppoſed to be firſt given it by Mr. *Gaſſendi*, but it appears otherwiſe, from a Place in his Animadverſions on *Diogenes*, quoted by Mr. *Mairan*.

The Cauſe of an *Aurora Borealis*, in general, he takes to be a Light called the Zodiacal Light, which is in reality nothing elſe but the Atmoſphere of the Sun ſpread on each Side of him along the Zodiack, in the Form of a Pyramid. This ſometimes is extended

tended to ſuch a Length as to reach beyond the annual Orbit of our Earth, and in theſe Circumſtances ſometimes to blend itſelf with our Atmoſphere, and being of an Heterogeneous Nature, produces the ſeveral Appearances which are obſerved in, and uſually compoſe the *Northern Lights*. This he undertakes to explain, and prove more largely, in the ſequel of the Work.

A Diſcourſe upon the Nature of the *Zodiacal Light*, or Sun's Atmoſphere, and the Matter of which it conſiſts, is the Subject of the third Chapter. That it is very different from the Ambient Æther, he ſays is evident, in that the Æther reflects none of the Light of the Sun, is extremely rare, and altogether imperceptible. Whether the *Zodiacal Light* of the Solar Atmoſphere be any Emanation from the Body of the Sun, a Species of Effervеſcence, or Depuration of its groſſer Parts, an Amaſs of Heterogeneous Parts diffuſed in the Æther, that meeting from all Parts, tend towards the Sun, *&c.* he will not undertake to determine.

It is enough for his Purpoſe, that it is of a luminous Nature, whether in itſelf, or becauſe ſtrongly illuminated by the Rays of the Sun, whoſe Body it environs. He does not deny but that it may be alſo of an inflammable Nature, nay actual Flame or Fire, though very fine and rare.

He obſerves, that the Form in which the Atmoſphere of the Sun is commonly ſeen in total Eclipſes of the Sun, is Round, though ſometimes Conical, of which he gives us a Figure.

At all other times it moſt uſually preſents itſelf to us in the Form of a lucid Pyramid, or Lance, lying

oblique

oblique to the Horizon, along the Zodiac, and for that reaſon call'd by the late Mr. *Caſſini* the *Zodiacal Light*. Mr. *J. Childrey* in his Hiſtory of the Natural and Artificial Rarities of *England*, deſcribes it thus. There is another thing which I muſt needs recommend to the Obſervation of Mathematical Men, which is, that in *February*, and for a little before, and a little after that Month, as I have obſerved ſeveral Years together about Six in the Evening, when the Twilight has almoſt departed the Horizon, you ſhall ſee a plainly diſcoverable Way of the Twilight, ſtriking up towards the *Pleiades*, and ſeeming almoſt to touch them. It is to be obſerved any clear Night, but it is beſt ſeen *illuni Nocte*. There is no ſuch Way to be obſerv'd at any other Time of the Year, that I can perceive, nor any other Way at that time to be perceived darting up elſewhere; and I believe it has been, and will be conſtantly viſible at that Time of the Year. But what the Cauſe of it in Nature ſhould be, I cannot yet imagine, but leave it to farther Enquiry.

Upon a farther and cloſer Enquiry, and Conſideration of this Matter, the ingenious Author, Mr. *Mairan*, tells us, he takes it to be the Solar Atmoſphere, and therefore treats at large of the Reality, Viſibility and Antiquity of this Light.

I beg leave to tranſcribe the Accounts of the ſame, given in by the Reverend Dr. *Derham*, Canon of *Windſor*. He informs us, that about a Quarter of an Hour after Sun-ſet, *April* 3, 1707, he perceived in the Weſtern Parts of the Heavens a long ſlender Pyramidal Appearance, perpendicular to the Horizon. The Baſe of this Pyramid he judged to be

the Sun, then below the Horizon. Its *Apex* reached fifteen or twenty Degrees above the Horizon: It was throughout of a rusty red Colour, at first pretty vivid and strong, but the Top part much fainter than the Bottom nearer the Horizon. He did not remember he ever saw any thing like it, except the white Pyramidal Glade, which is now entitled by the Name of the *Aurora Borealis*, that being like it except in Colour and Length. Again, on the 20th of *March*, 171$\frac{1}{6}$, in the Evening, he espied a very odd Sort of Light in the Constellation of *Taurus*. This Glade of Light had the same Motion that the Heavens had, and was much like the Tail of a Comet, but pointed at the upper End. This Light, I doubt not, is such as Dr. *Childrey* first observed in *England*, and *Cassini* and others afterwards in *France*.

Mr. *Mairan* proceeds to give an Account of the true Figure, Extent, Situation, *&c.* of this Light, or Atmosphere of the Sun. Its true Figure he judges, with Mr. *Fatio*, to be lenticular, and gives a Projection of it upon the Plane of the Sun's Equator, the Eye being supposed in the Axis of the Sun produced through his South Pole at such a Distance as makes the Solar Atmosphere appear under the Angle of forty-five Degrees. In it you have a View of the Nodes, Poles, Limits, Declination and Extent, passing through and beyond the Orbits of *Mercury* and *Venus*, and in some Parts beyond the *Orbis Magnus*. This last Article of its Extent he demonstrates from several Observations of the Elongations of the Apex of this Pyramid from the Centre of the Sun. This has been found to be sometimes double that of *Venus*, and other times 90 Deg. and once or twice above

100,

100, whereas an Elongation of 90 Deg. gives the Diſtance of the *Apex* from the Sun equal to that of the Earth at the time of Obſervation.

This Section is cloſed with an Account of the Changes, both real and apparent, to which the *Zodiacal Light*, or Solar Atmoſphere is liable Its Length has been for ſome time upon the Increaſe, afterwards in a diminiſhing Condition, and has been altered ſo much in the Compaſs of thirty-ſeven Months, as to have been 30 Deg. longer at one time than at another. The Changes in Luminouſneſs, Denſity and Tranſparency, has likewiſe been found to be very conſiderable. Sometimes the *Zodiacal* Light has been ſo rare and weak as to be but juſt viſible, afterwards for a long time not viſible at all.

Hereupon our ingenious Author thinks proper to obſerve, that theſe Conſiderations may ſerve in ſome Meaſure to account for the Inconſtancy of the *Aurora Borealis*, as alſo for their Non-appearnce for ſome Years; ſince they owe their Original to, and have ſo cloſe a Connexion with the *Zodiacal Light*, whoſe Appearance is ſo uncertain. Add to this the *Zodiacal Light*, as he afterwards ſhews, muſt not only be of a ſufficient Length and Denſity, but the Earth muſt be in or near the Nodes, form'd by the Interſection of the Plane of the Sun's Equator with the Plane of the Ecliptick.

The ſecond Section treats at large of the Altitude of our Atmoſphere, and of that of the Region in it uſually poſſeſs'd by the *Aurora Borealis*. Under this Head he diſcourſes of the ſeveral Methods the Mathematicians have uſed to find the greateſt Heights of the Air, ſuch as the Duration of the Twilight, the Altitude of the *Mercury* in the Barometer, and

rejects them as insufficient for that Purpose; the Atmosphere being much higher than what has been ever found by them, and consisting of a Fluid much finer than the gross or common Air, the Height of which last only is measurable by these ways.

Mr. *Mairan* therefore goes on to settle the Altitude of the *Northern Lights*, after another manner, founded upon several Observations made at very distant Places at the same time, and fixes some *Auroræ Boreales* to be but one hundred Leagues, though others are no less than three hundred, and the far greater Number of them about two hundred Leagues above the Surface of the Earth.

Mr. *Cramer*, Professor of the Mathematicks at *Geneva*, computes the Height of the *Aurora Borealis*, seen at the same time at *Geneva* and *Montpellier*, *Feb.* 15th, 1730, to be $\frac{111}{1000}$ of a Semidiameter of the Earth, *i. e.* about 160 Leagues.

Mr. *Meyer* has proposed in the Memoires of the Academy of *Petersburgh*, a very ingenious Method of finding the Height and Distance of a *Boreal Arc*, from any Observer, by a single Observation. Mr. *Mairon* applies this Method to such *Auroræ Boreales* as were capable of it, and finds that the *Boreal Arcs* of several were no less than an hundred Leagues high.

It is on this account that in the next Chapter our Author considers some Solutions that have been offered to solve these Appearances of the *Northern Lights*, and sets them aside as insufficient, because they suppose Causes which have no Existence, or at least no Efficacy at so great a Height in the Atmosphere.

The

The next Section is the principal, and is engag'd in explaining the ſeveral particular Appearances of the *Lumen Boreale*, ſuch as its Situation, ordinarily towards the *North*, declining a little towards the *Weſt*; its dark, duſky, circular Baſis, ſurmounted ſometimes with one or more luminous Arcs; from behind which Columns, or Streams of Light, ſeem to iſſue either perpendicularly or concentric with the Arcs; add to theſe the Rainbow-Colours, Flaſhes, Vibrations, and in the laſt Place, a Glory, Canopy, or *Corona*, form'd by a Concourſe of the Rays of the Matter of this *Phænomenon*, near the Zenith of the Place.

Mr. *Mairan* premiſes an Inveſtigation of the *Locus*, or Limit of the Attractive Forces of the Sun and Earth, ſo that a Particle of Matter placed any where in it, will be equally attracted by both, or tend as much towards the Earth as it does towards the Sun. He finds, that if in a Line connecting the Centres of the Sun and Earth, a Point be taken at the Diſtance of about 43 Semidiameters of the Earth from her Centre, that Point will be in this Limit, ſo that a Particle placed there, will not gravitate either towards the Sun or Earth, but remain in *Æquilibrio*, the equal and contrary Forces of the Sun and Earth deſtroying each other. The Uſe he makes of this is to ſhew, that an *Aurora Borealis* may poſſibly be formed by a Deſcent of the *Zodiacal Matter*, lying between this Point of *Æquilibrium* and the Earth; tho' it does not reach ſo far as to involve the Earth itſelf. But the *Aurora* in this Caſe will be an incompleat and particular one.

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The *Lumen Boreale* ordinarily appears in the Northern Parts of the Heavens, becauſe tho' the whole Atmoſphere of the Earth be involved in the *Zodiacal Matter* (or Solar Atmoſphere) yet 'tis thrown off both ways, from the Equatorial towards the Polar Regions.

This is owing to a double Cauſe, the firſt is the centrifugal Force, ariſing from the diurnal Motion of the Earth, which being greateſt at the Equator (and gradually leſſening as you approach the Poles, where it vaniſhes) makes greateſt Oppoſition there, and not only hinders the Entrance of the *Zodiacal Matter* into the Earth's Atmoſphere, near the Equatorial Region, but turns it aſide into a Courſe towards each Pole; and the Author does not queſtion but an *Aurora Auſtralis* might be ſeen at proper times in the Southern Temperate Zone, juſt as an *Aurora Borealis* is in ours, which is Northern, attended with ſimilar *Phænomena*, were there but attentive Obſervers.

The ſecond Cauſe is the progreſſive Motion of the Earth in its annual Orbit near one half of the Year with the *North Pole* foremoſt, and in the other half with the *South Pole*, moving thro' the *Zodiacal Matter*.

The natural Conſequence of which will be a heaping up of Matter, more on the Polar Regions than the Equatorial or Temperate, and this accounts in part for the Declination of the Centre of the luminous Arcs, ſometimes near ten Degrees from the *Pole*; the Direction of this Motion of the Earth not coinciding with the Direction of the Axis of the Earth, at thoſe times.

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The dark Annular Segment next the Horizon appearing like a heavy black Cloud, or Miſt, is form'd out of the denſeſt and ſpecifically heavieſt Parts of the *Zodiacal Matter*, which in their Deſcent muſt ſink deepeſt into the Earth's Atmoſphere, and are leaſt inflammable in their Nature, while the rarer and lighter Parts, which are more inflammable and luminous, if not actually inflam'd, form the Arc or Arcs that lie above the dark Segment. The ingenious Author ſpeaks of a *Fort de l' incendie*, a Place where the *Zodiacal Matter* collected together, and moving or paſſing thro' it, is actually turn'd into Flame. Thus long Trains of deſcending *Zodiacal Matter* arriving in their Deſcent at this Place, being kindled, or at leaſt reflecting the Light of that *Incendium*, produce the ſeveral Columns or Streams of Light that appear above, or behind the obſcure circular Baſe, or luminous Arches.

The Breaks that are ſometimes viſible in theſe Arches, are occaſioned by the Deſcent and Paſſage of ſeveral diſcontinued Trains and Flakes of the denſer and leaſt inflammable Parts of the *Zodiacal Matter*, between the Eye of the Spectator and the luminous Arch.

The various Colours ariſe from a Separation of the Rays of Light from each other, either by a ſort of Filtration in paſſing thro' Mediums of different Denſities, or by the Divergence of the differently refrangible and coloured Rays (or rather from the different Celerities of thoſe Rays, as the Author ſays he has explained more at large in another Place) after the manner that the Colours are formed in Clouds near the Horizon about the riſing or ſetting Sun.

To

To conclude, the Canopy in a compleat *Aurora Borealis* he looks upon to be an Object purely optical, a ſimple Appearance ariſing from a ſingular Diſtribution of ſeveral perpendicular Columns, or Trains of *Zodiacal Matter*, as he explains more at large in two Figures. This Exactneſs and Regularity in the Diſtribution makes it an uncommon *Phænomenon*; ſo that among an hundred *Auroræ Boreales* that have been obſerved, he has met with but three attended with a *Corona*.

What remains, is only to take Notice of ſome of the Queries which relate to ſeveral Appearances in Nature, that ſeem to be explicable by our Author's Hypotheſes of a Solar Atmoſphere, ſuch as the *Nebulæ*, or lucid Spots obſerv'd among the fix'd Stars, the Spots in the Sun, the Atmoſphere and Tails of Comets, *&c.*

The *Nebulæ* are certain luminary Spots or Patches, which diſcover themſelves only by the Teleſcope, and appear to the naked Eye like ſmall fix'd Stars. They are ſix in Number, and are accurately deſcribed in *Philoſoph. Tranſact.* N° 347. Some of them have no Sign of a Star in the middle of them, and are properly *Nebulæ*, others have, and then are called *Nebuloſæ*. They are look'd upon by ſome to be in reality nothing elſe but the Light coming from an immenſe great Space in the Æther, thro' which a lucid Medium is diffuſed, that ſhines with its own proper Luſtre, making a perpetual uninterrupted Day, by no means owing to the Illumination of a central Body, or Star.

But Mr. *Mairan* ſeems to be of another Mind, and queries thus: Since the fix'd Stars are Bodies of

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the ſame Nature with our Sun, may not ſome of them have Atmoſpheres ſurrounding them ſo luminary and extended, as to become viſible to us by a Light eaſily diſtinguiſhable from that of the central Body, and may not Atmoſpheres of others be ſo denſe as well as luminous, and extended, as may ſuffice to obfuſcate (to uſe the Author's Expreſſion) the Light of the Star involved in it? Are not the *Nebuloſæ* of the former Sort, and the *Nebulæ* of the latter? The lucid Spot in the *Cingulo Andromedæ*, which after *Hevelius* our Author continues to call a *Nebuloſa*, has been found by the late Mr. *Caſſini* to reſemble the *Zodiacal Light* in ſome Circumſtances, and by Mr. *Kirch* to have ſuffer'd ſome Changes appearing and diſappearing by turns.

Mr. *Mairan* obſerves by the way, that this Spot was firſt diſcover'd, not by Mr. *Bullialdus* in 1660, as is commonly believed, but by Mr. *Simon Marius* in 1612, who fully deſcribes it in the Preface to his *Mundus Jovialis*.

The luminous Space round the *Nebuloſæ* of *Orion's Sword*, diſcover'd and deſcribed by Mr. *Hugens*, he takes to be an Aſſemblage, or Sum Total of the ſeveral Atmoſpheres of the Stars, plainly viſible within that Space, and it may be of ſome others that are concealed from our View. The Irregularity of the Shape is no Difficulty to him, it ariſing from the different, and to us ſeemingly irregular Poſitions of their Atmoſpheres. He adds, as a Confirmation of his Hypotheſis, that the Brightneſs and very Figure of this Space has ſuffered ſome Alterations ſince Mr. *Hugens*'s Time. That one of the Stars delineated by Mr. *Hugens* without any ſurrounding Light, has

ſince been found to have a pale Light like an Atmoſphere ſurrounding it.

Quer. 2. Is not the Solar Atmoſphere liable to frequent Fermentations, and ſubſequent Precipitations of its groſſer Parts towards the Surface of the Sun? and are not the different Degrees of Brightneſs and Tranſparency owing hereunto? ſince the Changes in our Air, or Atmoſphere, are not ſufficient to account for the Non-appearance of the *Zodiacal Light* in ſome convenient Seaſons, and clear Nights.

Quer. 3. May not the Spots, ſo often of late obſerved in the Surface of the Sun, be owing to theſe Precipitations of the groſſer Parts of the *Zodiacal Light*, ſince there ſeems to be ſome Analogy or Correſpondence between the Frequency, Ceſſation and Returns of theſe Spots, with the Ceſſation, Returns and Apparitions of the *Zodiacal Light*?

Quer. 4. Are not the Inferior Planets, *Mercury* and *Venus*, almoſt always immerſed in the *Zodiacal Matter*? and may not that be one Reaſon why 'tis ſo difficult to obſerve Spots in them? May not a Change, the Denſity, or Magnitude of the Solar Atmoſphere, be one Reaſon why the Aſtronomers at *Paris* have not been able to obſerve thoſe Spots in the Diſk of *Venus* that have been taken Notice of, and deſcribed by Mr. *Bianchini* at *Rome*, a little before, ſince the Teleſcopes at *Paris* were of equal Length and Goodneſs?

Quer.

Quer. 20. May not the Augmentation of the Quantity of Matter in the Earth and Inferior Planets, by the continued Accumulation of the *Zodiacal Matter* on their Surfaces during a long Courſe of ſeveral Ages, produce, among other things, ſome Alteration in their Periodical Motions?

Quer. 21, *&c.* May not the Atmoſphere and Tail of a Comet be owing to the *Zodiacal Matter*, which the Comet during its Paſſage through the Atmoſphere of the Sun intercepts, and afterwards carries away with it, in its Aſcent from the Sun?

Quer. 28. Is not the Earth ſafe enough from all Danger of any Inundation, much more of an Univerſal Deluge, tho' it ſhould paſs thro' the Atmoſphere, or Tail of a Comet? ſince the Effects of ſuch a Paſſage can only be an *Aurora Borealis*, whoſe Matter is not at all of a watry vaporous Nature? A Conflagration rather than an Inundation might have been imagined to be the natural Conſequence, but Experience informs us, that if this Hypotheſis be admitted as genuine, that our Earth has been entirely plunged in this *Zodiacal Matter* without any ſenſible Heat attending it.

V. *A Letter from Monſ.* Du Fay, *F. R. S. and of the Royal Academy of Sciences at* Paris, *to his Grace* CHARLES *Duke of* Richmond *and* Lenox, *concerning* Electricity. *Tranſlated from the* French *by* T. S. *M D.*

Paris, December 27, 1733.

My LORD,

I Flatter my ſelf your Grace will not be diſpleaſed with an Account of ſome extraordinary Diſcoveries I have made in the *Electricity* of Bodies, nor refuſe the Favour I have to aſk, that it may be communicated to the *Royal Society*. I owe this Homage to that Illuſtrious Body, not only as a Member thereof, but in this reſpect as a Debtor to their Works; for the Writings of Mr. *Gray*, and the late Mr. *Hauksbee*, both of that *Society*, firſt put me upon the Subject, and furniſh'd me with the Hints that led me to the following Diſcoveries.

Firſt, I have found that all Bodies (metallick, ſoft or fluid ones excepted) may be made Electrick, by firſt heating them more or leſs, and then rubbing them on any ſort of Cloth. So that all kinds of Stones, as well precious as common, all ſorts of Wood, and in general every thing that I have made Trial of, became Electrick, by heating and rubbing; except ſuch Bodies as grow ſoft by Heat, as the Gums, which diſſolve in Water, Glue, and ſuch other Subſtances. 'Tis alſo to be remark'd, that the hardeſt

hardeſt Stones and Marbles require more chafing or heating than others, and that the ſame Rule obtains with regard to the Woods; ſo that Box, *Lignum Vitæ*, and ſuch others muſt be chafed almoſt to the Degree of burning, whereas *Fir*, *Lime-Tree* and *Cork*, require but a moderate Heat.

Secondly, Having read in one of Mr. *Gray*'s Letters, that Water may be made Electrical by holding the excited Glaſs Tube near it (a Diſh of Water being firſt fix'd to a Stand, and that ſet on a Plate of Glaſs, or on the Brim of a Drinking-Glaſs, previouſly chafed, or otherwiſe warmed) I have found upon Trial, that the ſame thing happen'd to all Bodies without Exception, whether ſolid or fluid; and that for that Purpoſe 'twas ſufficient to ſet them on a Glaſs-Stand ſlightly warm'd, or only dried; and then by bringing the Tube near them, they immediately became Electrical. I made this Experiment with Ice, with a lighted Wood-coal, and with every thing that came into my Mind; and I conſtantly remark'd, that ſuch Bodies as of themſelves were leaſt Electrical, had the greateſt Degree of Electricity communicated to them at the Approach of the Glaſs Tube.

Philoſ. Tranſ. N°422.p.227.

Thirdly, Mr. *Gray* ſays, towards the End of one of his Letters, that Bodies attract more or leſs according to their Colours. This led me to make ſeveral very ſingular Experiments. I took nine ſilk Ribbons of equal Size, one white, one black, and the other ſeven of the ſeven primitive Colours, and having hung them all in Order on the ſame Line, and then bringing the Tube near them, the black one was firſt attracted, the white one

Philoſ. Tranſact. N° 417 p. 44.

one next, and the others in Order ſucceſſively to the red one, which was attracted leaſt, and the laſt of them all. I afterwards cut out nine ſquare Pieces of Gauſe, of the ſame Colours with the Ribbons, and having put them one after another on a Hoop of Wood with Leaf-Gold under them, the Leaf-Gold was attracted thro' all the coloured Pieces of Gauſe, but not thro' the white or black. This inclined me at firſt to think, that the Colours contributed much to Electricity. But three Experiments convinced me of the contrary: The firſt, that by warming the Pieces of Gauſe, neither the black nor white Pieces obſtructed the Action of the Electrical Tube more than thoſe of the other Colours. In like manner, the Ribbons being warm'd, the black and white are not more ſtrongly attracted than the reſt. The ſecond is, the Gauſes and Ribbons being wetted, the Ribbons are all attracted equally, and all the Pieces of Gauſe equally intercept the Action of Electrick Bodies. The third is, that the Colours of a Priſm being thrown on a Piece of white Gauſe, there appear no Differences of Attraction. Whence it follows, that this Difference proceeds not from the Colour, as a Colour, but from the Subſtances that are employ'd in the dying. For when I coloured Ribbons, by rubbing them with Charcoal, Carmine, and ſuch other Subſtances, the Differences no longer proved the ſame.

Fourthly, Having communicated the Electricity of the Tube by means of a Packthread, after Mr. *Gray*'s manner, I obſerv'd, that the Experiment ſucceeded the better for wetting the Line; and that it may be ſupported on Glaſs-Tubes inſtead of Silk-Lines. And I made this Experiment at 1256 Feet Diſtance,

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in a Garden, tho' the Wind was high, and that the Line made eight Returns, and paſs'd thro' two different Walks. By means of two Silk Loops I adjuſted two Lines in ſuch a manner, that their Ends were but a Foot diſtance from one another, and I remark'd that the Electrick Virtue was ſtill communicated. I have ſince that ſeen in the *Philoſ. Tranſ.* N° 426, *p.* 431, that Mr. *Gray* had the ſame Thought, and that he had done the ſame with Rods. This Experiment put me upon placing ſeveral different Bodies between the two Lines, in order to examine which diminiſhed or intercepted the Electricity, and which gave no Obſtruction to it; I have given the *Academy* an Account of the Particulars, which I now omit for the ſake of Brevity.

Philoſ. Tranſ. N°417. *p.*39.

Fifthly, I ſuſpended a Child on Silk Lines, and made all the ſurpriſing Experiments deſcribed by Mr. *Gray*. But having tried the Experiment upon my own Body in the ſame manner, I obſerved ſeveral things very remarkable. Firſt, when I take the Paſte-board or Stand, on which the Leaf-Gold is laid, into my Hand, neither my other Hand nor my Face has any Attraction. But if another Perſon, who is in the Chamber, come near me, he will attract it with his Face, his Hand, or even with a Stick. Secondly, while I am ſuſpended on the Lines, if the electrick Tube be put near one of my Hands, or my Legs, and then if another Perſon approach me, and paſs his Hand within an Inch or thereabouts of my Face, Legs, Hand or Cloaths, there immediately iſſues from my Body one or more pricking Shoots, with a crackling Noiſe, that cauſes to that Perſon as well as to my ſelf, a little

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Pain reſembling that from the ſudden Prick of a Pin, or the burning from a Spark of Fire, which is as ſenſibly felt thro' ones Cloaths, as on the (bare) Hand or Face. And in the Dark theſe Snappings are, as may be eaſily imagined, ſo many Sparks of Fire. Theſe Snappings, or Sparks, are not excited, if a Bit of Wood, Cloth, or any other Subſtance than a living Body be paſſed over the Perſon ſuſpended on the Lines, unleſs it be a Piece of Metal, which produces very nearly the ſame Effect. Any other living Animal doth the ſame, if put on the Lines, and that firſt the Tube, and then the Hand be applied near it: But it is otherwiſe, if the Experiment be made with the Carkaſs of an Animal; for then one perceives only, if it be in the Dark, a ſtill uniform Light, without Snappings or Sparks. I omit many other Circumſtances of leſs Importance, though curious, to avoid running into too great a Length.

Sixthly, On making the Experiment related by *Otho de Guerik*, in his Collection of Experiments *de Spatio Vacuo*, which conſiſts in making a Ball of Sulphur render'd Electrical, to repel a Down-Feather, I perceived that the ſame Effects were produced not only by the Tube, but by all electrick Bodies whatſoever; and I diſcovered a very ſimple Principle, which accounts for a great Part of the Irregularities, and if I may uſe the Term, of the Caprices that ſeem to accompany moſt of the Experiments on Electricity. This Principle is, that Electrick Bodies attract all thoſe that are not ſo, and repel them as ſoon as they are become electrick, by the Vicinity or Contact of the electrick Body. Thus

Leaf-

Leaf-Gold is firſt attracted by the Tube; and acquires an Electricity by approaching it; and of conſequence is immediately repell'd by it. Nor is it re-attracted, while it retains its electrick Quality. But if, while it is thus ſuſtain'd in the Air, it chance to light on ſome other Body, it ſtraightways loſes its Electricity; and conſequently is re-attracted by the Tube, which, after having given it a new Electricity, repels it a ſecond time; which continues as long as the Tube keeps its Electricity. Upon applying this Principle to the various Experiments of Electricity, one will be ſurprized at the Number of obſcure and puzzling Facts it clears up. For Mr. *Hauksbee*'s famous Experiment of the Glaſs Globe, in which Silk Threads are put, is a neceſſary Conſequence of it. When theſe Threads are ranged in Form of Rays by the Electricity of the Sides of the Globe, if the Finger be put near the Outſide of the Globe, the Silk Threads within fly from it, as is well known; which happens only becauſe the Finger, or any other Body applied near the Glaſs Globe, is thereby render'd electrical, and conſequently repels the Silk Threads, which are endow'd with the like Quality. With a little Reflection one may in the ſame manner account for moſt of the other *Phænomena*, and which ſeem inexplicable, without attending to this Principle.

Seventhly, Chance has thrown in my way another Principle, more univerſal and remarkable than the preceding one, and which caſts a new Light on the Subject of Electricity. This Principle is, that there are two diſtinct Electricities, very different from one another; one of which I call *vitreous*

Electricity, and the other *reſinous Electricity*. The firſt is that of Glaſs, Rock-Cryſtal, Precious Stones, Hair of Animals, Wool, and many other Bodies: The ſecond is that of Amber, Copal, Gum-Lack, Silk, Thread, Paper, and a vaſt Number of other Subſtances. The Characteriſtick of theſe two Electricities is, that a Body of the *vitreous Electricity*, for Example, repels all ſuch as are of the ſame Electricity; and on the contrary, attracts all thoſe of the *reſinous Electricity*; ſo that the Tube, made electrical, will repel Glaſs, Cryſtal, Hair of Animals, *&c.* when render'd electrick and will attract Silk, Thread, Paper, *&c.* though render'd electrical likewiſe. Amber on the contrary will attract electrick Glaſs, and other Subſtances of the ſame Claſs, and will repel Gum-Lac, Copal, Silk, Thread, *&c.* Two Silk Ribbons rendered electrical, will repel each other; two Woollen Threads will do the like; but a Woollen Thread and a Silk Thread will mutually attract one another. This Principle very naturally explains, why the Ends of Threads, of Silk, or Wool, recede from one another in Form of a Pencil or Broom, when they have acquired an electrick Quality. From this Principle one may with the ſame Eaſe deduce the Explanation of a great Number of other *Phænomena*. And 'tis probable, that this Truth will lead us to the further Diſcovery of many other things.

In order to know immediately, to which of the two Claſſes of Electricity belongs any Body whatſoever, one need only render Electrical a Silk Thread, which is known to be of the *reſinous Electricity*, and ſee whether that Body, render'd electrical,

attracts

attracts or repels it. If it attracts, 'tis certainly of that kind of Electricity which I call *vitreous*; if on the contrary it repels, 'tis of the same kind of Electricity with the Silk, that is, of the *resinous*. I have likewise observed that communicated Electricity retains the same Properties: For if a Ball of Ivory, or Wood, be set on a Glass Stand, and this Ball be render'd electrick by the Tube, it will repel all such Substances as the Tube repels; but if it be rendered electrick by applying a Cylinder of Gum-Lac near it, it will produce quite contrary Effects, *viz.* precisely the same as Gum-Lac would produce. In order to succeed in these Experiments, 'tis requisite that the two Bodies, which are put near one another, to find out the Nature of their Electricity, be rendered as electrical as possible; for if one of them was not at all, or but weakly electrical, it would be attracted by the other, though it be of that Sort, that should naturally be repelled by it. But the Experiment will always succeed perfectly well, if both the Bodies are sufficiently electrical.

I have several other Methods to discover the Nature of the Electricity any Body is of; but my Letter is already long enough, and my Design was only to give your Grace a very succinct Extract of the Experiments I have made this last Year. I beseech your Grace to communicate it to the *Royal Society*, and in particular to Mr. *Gray*, who works on this Subject with so much Application and Success, and to whom I acknowledge my self indebted for the Discoveries I have made, as well as for those I may possibly make hereafter; since 'tis from his Writings

that

that I took the Resolution of applying my self to this kind of Experiments.

I have the Honour to be with the most sincere, and most respectuous Attachment,

My LORD,

Your GRACE's

Most Humble and most

Obedient Servant,

DU FAY.

FINIS.

Numb. 432.

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VI. *Clauſula excerpta*, ex Hiſtoriâ Variolarum quæ per Inciſionem excitantur, *ab* E. Timoni, *M. D. Scriptâ*, *R. S. Communicavit* Sam. Horſeman, *M. D.*

VII. *An Abſtract of a Letter from* Petrus Van Muſchenbroek, *M. D. F. R. S. Profeſſor of Mathematicks and Aſtronomy in the Univerſity of* Utrecht, *in* Holland; *to Dr.* J. T. Deſaguliers, *F. R. S. concerning Experiments made on the* Indian Magnetick-Sand.

VIII. *An Account of ſome Obſervations made in* London, *by Mr.* George Graham, *F. R. S. and at* Black-River *in* Jamaica, *by* Colin Campbell, *Eſq*; *F. R. S. concerning the* Going of a Clock; *in order to determine the Difference between the Lengths of* Iſochronal Pendulums *in thoſe Places. Communicated by* J. Bradley, *M. A. Aſtr. Prof. Savill.* Oxon. *F. R. S.*

IX. *A Continuation of an Account of an Eſſay towards a Natural Hiſtory of* Carolina, *and the* Bahama *Iſlands, by Mr.* Mark Catesby, *F. R. S. with ſome Extracts out of the Sixth Set; by Dr.* Mortimer, *R. S. Secret.*

Jos: Banks

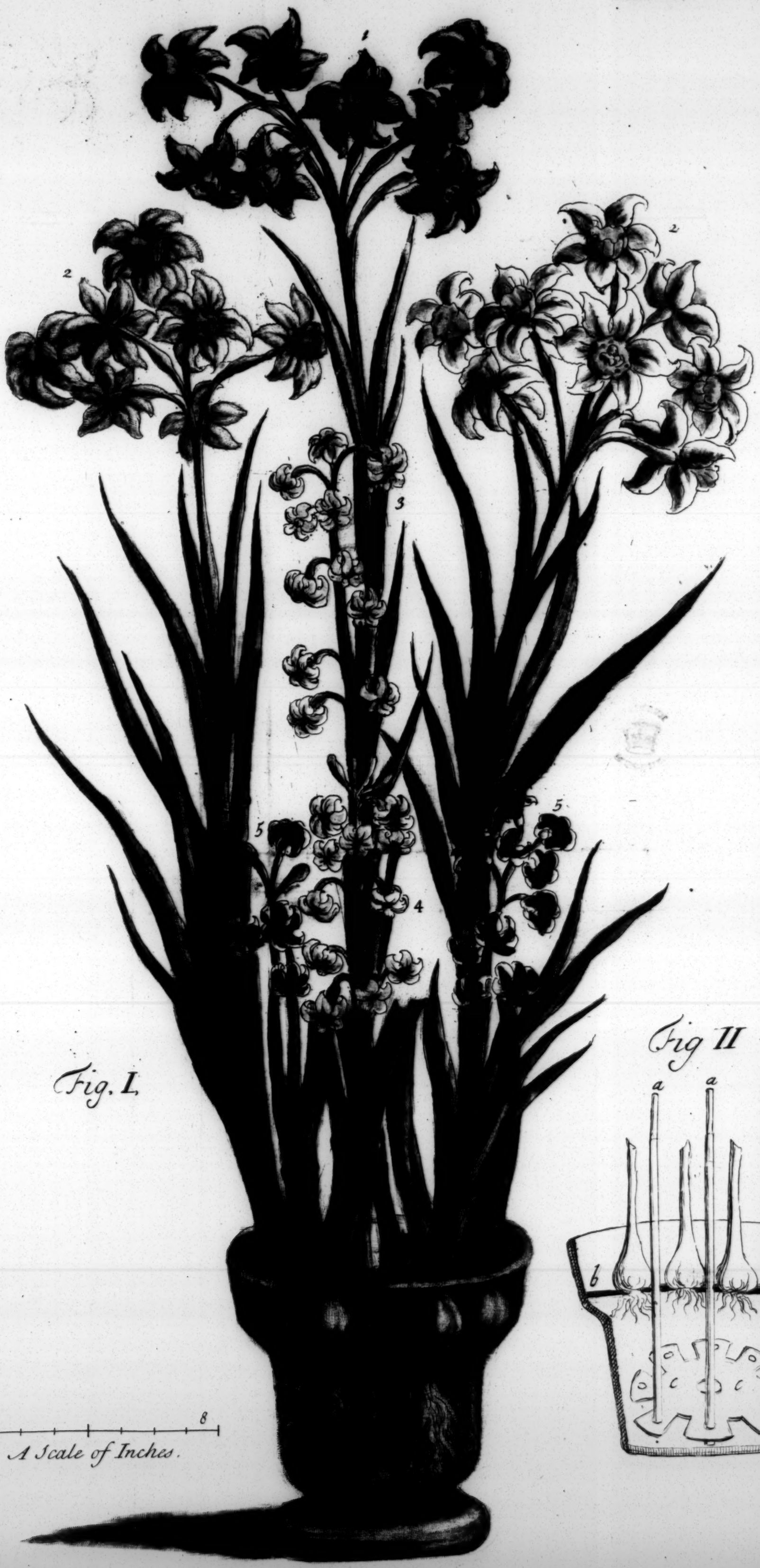
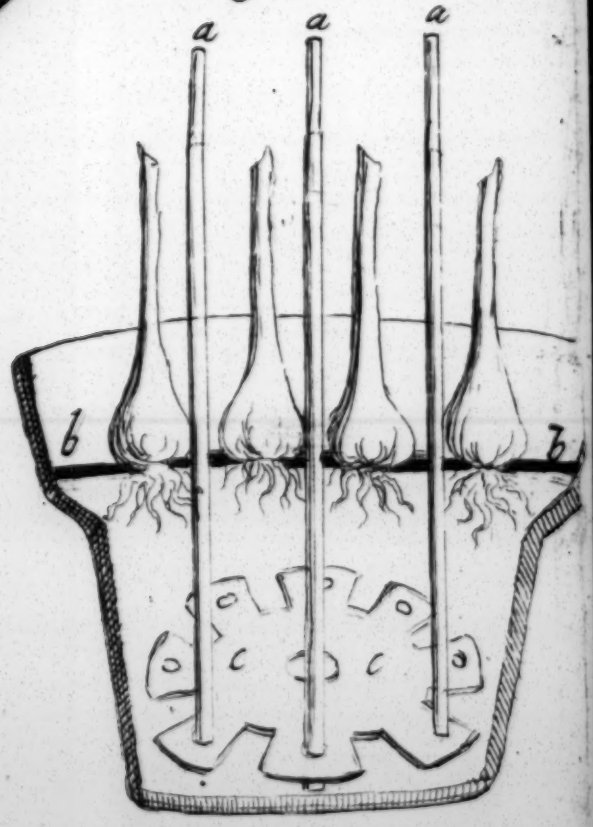
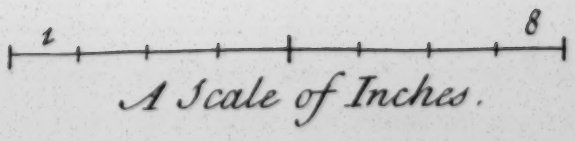


Fig. I.

Fig II





A Scale of Inches.

I. *Experiments and Obſervations on* Bulbous Roots, Plants, *and* Seeds *growing in* Water. *by Mr.* William Curteis.

ABout three Years ſince, ſeeing ſome *Bulbous Roots* ſet in Glaſſes filled with Water in a Shop Window, and being told they would Flower in that manner, I immediately tried a couple of *Hyacinths*, which blowed very prettily the next Spring: it pleaſed me much to ſee that we could have ſuch Things in a cloſe Room in Town, without the help of a Garden to produce them, having lately come out of the Country, and being a Lover of Flowers; wherefore I began to think if I could contrive a Method to make a Pot full blow together, with a mixture of ſeveral ſorts of Flowers with a variety of Colours, it would be an Improvement.

The next Year, I took a couple of common penny Garden Pots, and ſtopt the Holes at the Bottoms with Corks; and painted the Pots, and puttyed the Corks, that no Water could filtrate through them; then had a couple of Boards cut to fit the tops of the Pots, bored with ſeven holes at equal Diſtances, to place my Bulbs in, and likewiſe as many ſmall holes for placing of Sticks, to tye the Stems of the Flowers to; I then planted *Hyacinths*, *Narciſſus's*, *Tulips* and *Jonquils*, and filled the Pots with Water up to the Board, ſo that the Bulbs ſtood only upon the Water; where they blowed very well, and made the beſt Appearance, as I thought, I had ever ſeen, beyond any Flower-pot that could be dreſſed by gather'd Flowers.

After the Bloom was over, their Leaves looking green, I ſet them out in my little Garden, thinking any thing that looked green and made a tolerable Figure, agreeable in a *London* Garden; and not depending on the Bulbs again to be of any ſervice to be preſerved, I let them ſtand till toward Midſummer, and took no farther care, but now and then giving them freſh Water as it perſpired or evaporated, and when the Rains fill'd the Pots, I emptied them down to the Boards again; but the Bulbs ſhrinking, ſome of them ſlip'd through the Holes down to the Bottom of the Pot, and about Midſummer, when their Leaves began to grow Yellow, I went with a Deſign to pull them up and throw them away, I was ſurpriſed to find that the Bulbs which were buried in the Water were grown firm, and too large to be drawn back through the Holes, being ſound and fit for blowing the next Year, and increaſed in Off-ſets.

This occaſion'd me the next Year (which was the laſt) to try another Experiment of blowing my Bulbs under Water, which I found anſwer'd beyond what could be expected, for they rather out-do thoſe that grow in the Ground, in the ſtrength of their Stalks, the clearneſs of their Bloſſoms, the laſting of their Bloom, and likewiſe, the Difference of their Seaſons, which may be ſo manag'd, according to the warmth of the Rooms they are kept in, as to have the ſame Sorts in flower from *Chriſtmas*, till the natural Time of their Bloom in the open Ground, which is *March* and *April*.

But finding it very troubleſome to keep the Boards fix'd under Water, I thought Lead might anſwer the Purpoſe better; whereupon, I got ſome ſheet Lead,

of

of about four pounds to the Foot, cut fit to my Pot, and made holes in it proportionable to the bottoms of my Bulbs, and likewiſe ſmall holes to fix ſticks for the ſupport of the Leaves and Stems of the Flowers; I put a little coarſe Sand in the bottoms of my Pots, thinking it would ſupport the Sticks, and keep them ſteady; but when I came to make uſe of the Sticks, the Sand gave way; I then made falſe bottoms with Lead, and cut Holes oppoſite to thoſe at the Top, which anſwer'd my purpoſe. Upon taking up the Bulbs to put in theſe falſe bottoms, I found the Sand had corroded the Fibres, and changed them all like Ironmould, that I thought they were ſpoil'd; but rincing them in two or three Waters, it came clear off, and on fixing my falſe Bottoms, and placing the Bulbs in their holes, and filling them up with freſh Water, they recover'd, and never changed again in the clear Water, but thriv'd and put forth their Flowers very kindly, although by the Experiments which I had tried, before I could fix them right, I had often planted and tranſplanted them. But I found afterwards that Glaſs Jarrs of the Form as repreſented in the Plate, were the moſt convenient, both for ſeeing the Progreſs the Roots made, and for knowing when they want to be cleaned.

At Fig. I. is repreſented one of theſe Glaſs Jarrs, containing the following Flowers.

1. Golden Sun,
2. Boſſelman, } *Narciſſus's.*
3. Keyſers Jewel,
4. Pulchra, } *Hyacinths.*
5. Janus,

At Fig. II. is repreſented the Profile or Section of the ſame Jarr.

a. The Sticks to tie up the Leaves and Stems of the Flowers.

b. The upper Lead with Holes to ſupport the *Bulbs* and Sticks.

c. The under Lead with Holes to keep the Sticks ſteady.

By ſeveral Experiments on dried Bulbs, and thoſe that were taken freſh out of the Ground, I find the dried ones do beſt; for thoſe taken growing out of the Ground, being full of moiſture, will not ſo ſoon upon changing their Element, be acquainted with a new one; the Fibres they had ſtruck in the Ground, always rot, and they muſt make new ones in the Water, which makes them require a long Time before they can recover themſelves enough to flower. The Bulbs will not rot, yet they will not be ſo ſtrong as thoſe put into the Water when dry, which fill themſelves with moiſture by degrees: Therefore, when I plant my Bulbs, I ſet them at firſt on the top of the Water; for I found by two or three Experiments, that thoſe planted under Water did not puſh out their Fibres ſo ſoon, nor ſo ſtrong, as thoſe ſet upon the Water; the Reaſon of which I take to be, that they were fill'd with Water too ſoon, whereas thoſe ſet upon Water attracted it by degrees, and ſo made both the Fibres and the Bulbs grow ſtronger; and then about five or ſix Weeks after planting them, as the Fibres puſh out, I by degrees fill the Water higher and higher, till the whole Bulb is cover'd,

and

and ſo keep them till the Bloom is over, and the Seaſon for drying them returns.

One Obſervation ſurpriſed me, *viz.* two of my *Hyacinths* were mouldy, which Mould canker'd and eat holes through ſeveral of their Coats or Scales; this I pick'd and clean'd ſeveral times, but ſtill it ſpread farther and farther; but ſoon after they were covered with Water, I could perceive them heal by degrees, till they became perfectly ſound and blew their Flowers as kindly, as thoſe that had continued perfectly ſound.

By another Experiment, I tried what Bulbs would do if kept all the Year under Water: I left in water a *Narciſſus*, an *Hyacinth* of *Peru*, and ſeveral *Junquils*, that were planted in *October*, 1732; which are now as ſound and ſtrong, as thoſe I took out and dried, and promiſe fair for a Bloom; I obſerv'd that their old Fibres do not rot, till they are ready to puſh out new ones.

Another Obſervation ſeems worthy of Notice; one of my double *Hyacinths*, commonly called *Keyſers Jewel*, brought two Pods of Seed to maturity; which I have blowed for fourteen or fifteen Years ſucceſſively in the Ground, and could never find them make any thing towards ſeeding; and I have reaſon to think that ſeveral other Bulbs would have ſeeded, if I had taken timely care of them, but did not perceive it till too late.

Mr. *Miller*, in *Philoſ. Tranſ.* N°. 418. intimates that Bulbs ſet in Glaſſes grow weaker, and ſhould be renewed every Year with freſh ones; but I obſerve by this way of raiſing them under Water, that at their taking up, they are as large, and ſome of them

them ſtronger than when they were planted, and if they be dried at the proper Seaſon, will produce a ſecond Year as well as freſh ones.

I planted likewiſe *Ranunculos* and *Anemone Roots*, which grew and ſhot up the Stems of their Flowers very ſtrong, but the Buds of the Flowers were blaſted, which I am apt to think happened from their being crowded too much, having no convenience to give them free Air enough.

I alſo planted *Auriculas* and *Pinks*, the *Pinks* flowered, but the *Auriculas* were not ſtrong enough; they are ſtill both of them growing, and I am in expectation they will blow the next Seaſon.

I have tried alſo ſeveral Shrubs, as *Roſes*, *Jaſmines*, and *Honyſuckles*; which all grew, and ſtruck out freſh Fibres, and the *Roſe-tree* made ſix ſtrong Buds for Bloſſoms, but accidently ſetting them out in a hot Sun-ſhiny day in *April*, they were all ſcorch'd up, that they came to nothing; I obſerv'd, that ſtrong Suckers cut off two or three Inches under ground, without any Fibres, grew the beſt.

By another Experiment, I was willing to try what the Succulent Plants would do in this way; I took a Leaf of the *Opuntia* or *Indian Fig*, and laid it by to dry for three Weeks or a Month, till it had loſt all its moiſture, and was nothing but a dryed Skin; I then planted it in Water in the beginning of *July*, and tied it to a Stick that was fixed in one of my Leads, and filled the Pot ſo, that the Bottom of the Leaf was a quarter of an Inch in the Water; in about a Month's time the Leaf fill'd, ſtruck out Fibres, and put forth a freſh Leaf, which is now growing, and has made as much progreſs as ſuch a

Plant

Plant would do in the Earth, in the ſame ſpace of Time: I had no opportunity of trying other Succulent Plants.

Dr. *Mortimer* told me he had placed Beans upon Water, which bloſſomed and podded: This put me upon trying the Experiment with them, and likewiſe Peaſe at the ſame Time. I planted ſix Beans in a Pot, and fixed ſticks in it to ſupport their Stems as they grew; they bloom'd as freely as thoſe which are planted in the Ground, but did not pod ſo well, having not above a pod or two on each Plant, which came to perfection, and ripened their Seed; but this might happen for want of a little more Experience; the Peaſe which were of the Dwarf ſort, drew a little too much, and only put out three or four Bloſſoms at the extremity of their Tops, but every Bloſſom brought a Peaſe-cod, and ripened its Seed.

This growth of the Beans and Peaſe, made me imagine that other Seeds would ſucceed in the ſame manner, knowing they would chip upon being laid for a little time in Water, or in a moiſt Place: The only Difficulty was to invent ſomething proper for their ſupport in growing. The firſt Thing I tried was boring very little holes in a piece of Lead, fix'd in a Pot, and ſowing the Seeds thereon; I found they would ſprout, but as the Water evaporated, filling in freſh moved the Seeds from their places, that they could not fix themſelves to turn their Radicle down into the Water; I then tried Towe or Hemp, and ſpread it on the Lead, which I found anſwer the Purpoſe of ſupporting the Seed, which by that means grew, and the Radicle taking hold of the Towe, it was enabled to throw up its Plume or Shoot; I then

tried

tried ſeveral ſorts of ſmall Seeds, and found they would all grow; tho' I made the Experiment about *Chriſtmas*; but I found the Towe diſcoloured the Water, and gave an offenſive ſmell, and that the Seed did not thrive kindly: I then tried Wool and Cotton, the Cotton being too boyant, would not ſo well anſwer the Purpoſe; but Wool, when it is juſt buried in Water, being like a Jelly, and not drying ſo ſoon on the Top, even though the Water has left it, intirely anſwers the Purpoſe as well as ſowing them in the Earth; and if the Seed be good, will keep clean for two or three Months; for this way of ſowing will diſcover whether the Seed be mixed with old Seed (as thoſe bought at a Seed-ſhop generally are.) I ſowed ſeveral ſorts of Sallad-Seeds in this way, and they came to as great perfection as thoſe of the ſame kind raiſed in Hot-beds: and thus they may be produced in any Room or Garret, early in the Spring, and ſo on till late in Autumn, till the cold Weather comes in, and afterwards in the middle of Winter, in a Room where a conſtant Fire is kept. I had ſeveral Sallads laſt Spring, and this Autumn, by ſowing different ſorts every Week one under another, in ſmall half-penny Pots; as *Lettice*, *Creſſes*, *White Muſtard*, *Rape*, and *Raddiſh*, which in a Fortnight after ſowing would be fit to cut; ſo that keeping a proper Succeſſion, I had every Week a tolerable Sallad for two or three Perſons.

My way of ſowing of theſe Seeds, is to have a piece of Lead bored full of holes, and made to fit the Pot, about half an inch below the Top; then filling it with Water, I take a little clean Wool, and ſpread it even and thin, upon the ſurface of the Lead,

quite

quite home to the ſides of the Pot, which will then look like a Jelly; if there is too much Water, I pour it off, till the Wool only appears cover'd or fill'd with Water; then I ſow the Seed pretty thick, and in forty-eight Hours it will begin to chip, and in a Fortnight after ſowing will be fit to cut for a Sallad.

I obſerv'd from ſeveral Experiments, that any of theſe Plants tranſplanted out of the Earth into Water would not thrive kindly; but thoſe raiſed in Water may be tranſplanted into Earth, ſo that this Method of raiſing Seeds in Water may be of uſe in a dry Seaſon, to be pricked out into the Earth, though they will not come up in ſuch a Seaſon, if ſowed in the Ground, yet tranſplanted from Water they will take as freely to the Earth as if raiſed in it.

I don't know but from the foregoing Experiments in Water, we may come at a better Way of planting in the Earth, eſpecially ſome Roots, which are apt to rot in the Ground, as *Anemones*, *Ranunculos*, and *Hyacinths*: from an Obſervation I have frequently made, but never before took notice enough to improve it, which is, that I have often ſeen a Bulb drop'd by chance upon the Ground, ſtrike out Fibres ſtronger and more numerous than thoſe planted in their uſual depth of Earth would do. The uſe I would make of this Obſervation, is, that when I plant my Bulbs, I take out the Earth of the Bed, I deſign to plant, as deep as the Bulbs or Roots are to ſtand when planted, and place my Bulbs on the Surface, till the moiſture of the Earth ſhall have attracted their Fibres, and they begin to ſhoot up their Plume, and then by degrees I cover them over to the thickneſs of Mould, that they ſhould ſtand in, by which means they will be in no danger of rotting after they have got ſtrong

Fibres; for when we plant theſe Bulbs or Roots, it is generally either too wet or too dry; if it be a wet Seaſon, the Bulbs are too ſoon ſaturated with Moiſture, which rots them; and if it be too dry, they lie ſo long, before they can attract Moiſture enough to make them Vegetate, that they grow mouldy, and are render'd dry and hard as a piece of Stick, ſo that the firſt Rain infallibly rots them.

N. B. Theſe Experiments were made without the Benefit of any Sun, all my Windows having a *Northern* Expoſition.

As theſe Experiments have open'd a new Scene of Knowledge in the Vegetable World, and may be of great Uſe in Natural Philoſophy, and particularly improve the Art of Gardening; its to be hoped the Curious will carry on the Inquiry as they have Leiſure and Opportunity.

Directions for Planting Bulbous Roots *in Pots or Glaſſes of Water.*

When the Leaden falſe Bottoms are fix'd down tight, within two or three Inches from the Bottom of the Pots (which is only deſign'd to hold the Sticks ſteady that are to ſupport the Leaves and Stems of the Flowers) lay on the Lead, which is to ſupport the Bulbs, placing the notched Part oppoſite to that in the falſe Bottom, as near as the Sticks when placed will ſuffer it; then place your Bulbs in each Hole, and fill in Water up to the Lead, which will then touch the Bottom of the Bulb, and as the Water evapo-

evaporates or perſpires, keep it fill'd to that height, till the Bulbs have ſtruck their Fibres pretty ſtrong into the Water, which may be in a Month or ſix Weeks; then fill in Water about half an Inch above the Lead, and by Degrees as the Fibres ſtrengthen, and the Plume or Head ſprouts, fill it higher and higher till the Bulbs be intirely buried under Water, which muſt be continued till the Seaſon for drying them returns.

But you muſt obſerve at the Planting the Bulbs to clean them very well from any Foulneſs they may have at their Bottoms, by ſcraping them with the Point of a Knife, till the ſound part of the Bulb appears, and likewiſe clear them of all their looſe Skins, and even the brown Skin, till they appear White; which otherwiſe will diſcolour and foul the Water that ſhould be kept as clear as poſſible; and for this Reaſon, the Notches in both the Leads are contriv'd, that upon ſhifting all the Water out of the Pots, if there happens to be any Sediment, by ſhaking the Pots once or twice as it is pour'd off, all the Foulneſs may come with it; but this ſhifting of the Water need not be done but once or twice in a Winter, or when ever you ſee occaſion by the Diſcolouring or Foulneſs of it; and at the ſame Time it will be neceſſary with a Painter's Bruſh to clean off all Slimyneſs that will adhere to the Sides of the Pots and Bulbs, and rince them well, by pouring Water on them at a little Diſtance: By this method they may be kept perfectly clean; and at any time when the outward Skins of the Bulbs looſen and begin to decay, clear them off, which otherwiſe would occaſion Foulneſs; and when ever you ſee Duſt ſwimming on the ſurface

of the Water, fill the Pot full, and let it run over, which will carry it all off, and then pour off the Water to its uſual height.

N. B. Plant Bulbs of equal bigneſs, at leaſt in height, together in the ſame Pot, that they may have the ſame Benefit of the Water; therefore I plant *Narciſſus* and *Hyacinths* and Bulbs of that ſize together; *Tulips* and *Junquils*, &c. by themſelves; and *Crocus* and *Snow-drops*, &c. by themſelves.

Bangor-Court, Shoe-Lane,
Decemb. 19, 1733.

II. *A Catalogue of* Eclipſes, *of* Jupiter's Satellites, *for the Year* 1735. *by* James Hodgſon, *F. R. S. Maſter of the Royal Mathematical School at* Chriſt's-Hoſpital, London.

The Number of Immerſions and Emerſions amounting to 418.

ECLIPSES *of the firſt Satellite of* JUPITER.

D.	H.	M.	S.
		JANUARY.	
		Immerſions.	
1	7	7	17
3	1	35	4
4	20	2	55
6	14	30	48
8	8	58	43
10	3	26	40
11	21	54	39
13	16	22	40
15	10	50	43
17	5	18	48
18	23	46	56
20	18	15	7*
22	12	43	20
24	7	11	35
26	1	39	52
27	20	8	11
29	14	36	33
31	9	4	57

D.	H.	M.	S.
		FEBRUARY.	
		Immerſions.	
2	3	33	23
3	22	1	53
5	16	30	26*
7	10	59	0
9	5	27	34
10	23	56	10
12	18	24	49*
14	12	53	31
16	7	22	14
18	1	50	58
19	20	19	44
21	14	48	31
23	9	17	19
25	3	46	10
26	22	15	0
28	16	43	53*

D.	H.	M.	S.
		MARCH.	
		Immerſions.	
2	11	12	43
4	5	41	38
6	0	10	31
7	18	39	26
9	13	8	21
11	7	37	17
13	2	6	13
14	20	35	9
16	15	4	6*
18	9	33	2
20	4	1	57
21	22	30	52
23	16	59	48*
25	11	28	42
27	5	57	37
29	0	26	29
30	18	55	21

APRIL.

Eclipses *of the first Satellite of* Jupiter.

D.	H.	M.	S.
		April.	
		Immerſions.	
1	13	24	12
3	7	53	8
5	2	21	52
6	20	50	43
8	15	19	32*
10	9	48	18
12	4	17	3
13	22	45	48
15	17	14	33
17	11	43	16
19	6	11	56
21	0	40	34
22	19	9	10
24	13	37	46*
26	8	6	21
28	2	34	54
29	21	3	26
		May.	
		Immerſions.	
1	15	31	57
3	10	0	21
5	4	28	46
6	22	57	10
8	17	25	34
10	11	53	57*
12	6	22	18
14	0	50	37
15	19	18	54
17	13	47	9*
19	8	15	24
21	2	43	39
22	21	11	54
24	15	40	6*
26	10	8	16
28	4	36	26
29	23	4	36
31	17	32	45
		June.	
		Immerſions.	
2	12	0	55*
4	6	29	5
6	0	57	16
7	19	25	25
9	13	53	34*
11	8	21	44
13	2	49	56
14	21	18	6
16	15	46	18*
18	10	14	33
		Emerſions.	
20	6	57	17
22	1	25	34
23	19	53	51
25	14	22	10*
27	8	50	29
29	3	18	50
30	21	47	14
		July.	
		Emerſions.	
2	16	15	40
4	10	44	10*
6	5	12	42
7	23	41	14
9	18	9	48
11	12	38	26*
13	7	7	5
15	1	35	44
16	20	4	25
18	14	33	9*
20	9	1	58
22	3	30	46
23	21	59	38
25	16	28	30
27	10	57	25*
29	5	26	22
30	23	55	22
		August.	
		Emerſions.	
1	18	24	24
3	12	53	28

Eclipses of the first Satellite of Jupiter.

D.	H.	M.	S.
5	7	22	33*
7	1	51	39
8	20	20	46
10	14	49	56
12	9	19	9*
14	3	48	25
15	22	17	42
17	16	46	58
19	11	16	14*
21	5	45	33
23	0	14	53
24	18	44	16
26	13	13	39
28	7	43	2*
30	2	12	27
31	20	41	52

September.

Emerſions.

2	15	11	16
4	9	40	40*
6	4	10	6
7	22	39	30
9	17	8	56
11	11	38	21
13	6	7	47
15	0	37	13
16	19	6	35
18	13	35	58
20	8	5	22*
22	2	34	42
23	21	4	1
25	15	33	22
27	10	2	40*
29	4	31	57
30	23	1	12

October.

Emerſions.

2	17	30	27
4	11	59	36
6	6	28	46*
8	0	57	52
9	19	26	58
11	13	56	0
13	8	25	2*
15	2	54	1
16	21	22	58
18	15	51	50
20	10	20	42
22	4	49	31
23	23	18	19
25	17	47	2
27	12	15	44
29	6	44	20*
31	1	12	56

November.

Emerſions.

1	19	41	31
3	14	10	3
5	8	38	31
7	3	6	52
8	21	35	11
10	16	3	30
12	10	31	48
14	5	0	3*
15	23	28	14
17	17	56	24
19	12	24	30
21	6	52	36
23	1	20	39
24	19	48	38
26	14	16	33
28	8	44	26
30	3	12	20

December.

Emerſions.

1	21	40	15
3	16	8	6
5	10	35	57
7	5	3	47*
8	23	31	36
10	17	59	23
12	12	27	11
14	6	54	59
16	1	22	46
17	19	50	35
19	14	18	25

Jupiter and the Sun in Conjunction.

Eclipses *of the ſecond Satellite of* Jupiter.

D.	H.	M.	S.
		January.	
		Immerſions.	
2	17	27	57
6	6	44	17
9	20	0	40
13	9	17	14
16	22	34	4
20	11	50	59
24	1	8	2
27	14	25	14
31	3	42	36
		February.	
		Immerſions.	
3	17	0	7*
7	6	17	51
10	19	35	38
14	8	53	34
17	22	11	39
21	11	29	48
25	0	48	3
28	14	6	24
		March.	
		Immerſions.	
4	3	24	48
7	16	43	15*
11	6	1	44
14	19	20	15
18	8	38	45
21	21	57	15
25	11	15	44
29	0	34	9
		April.	
		Immerſions.	
1	13	52	33*
5	3	10	53
8	16	29	10*
12	5	47	20
15	19	5	27
19	8	23	29
22	21	41	21
26	10	59	10
30	0	16	56
		May.	
		Immerſions.	
3	13	34	21*
7	2	51	50
10	16	9	15*
14	5	26	34
17	18	43	48
21	8	0	59
24	21	18	4
28	10	35	5*
31	23	52	3
		June.	
		Immerſions.	
4	13	9	4*
8	2	26	1
11	15	43	2*
15	5	0	3
18	18	17	12
		Emerſions.	
22	10	22	30*
25	23	39	51
29	12	57	14*
		July.	
		Emerſions.	
3	2	14	48
6	15	32	36
10	4	50	25
13	18	8	27
17	7	26	32
20	20	44	50
24	10	3	16*
27	23	21	48
31	12	40	30*
		August.	
		Emerſions.	
4	1	59	13
7	15	18	12

ECLIPSES *of the ſecond Satellite of* JUPITER.

D.	H.	M.	S.
11	4	37	15
14	17	56	31
18	7	15	50*
21	20	35	10
25	9	54	40*
28	23	14	13

SEPTEMBER.

Emerſions.

1	12	33	47
5	1	53	21
8	15	12	56
12	4	32	32
15	17	52	6
19	7	11	39*
22	20	31	4
26	9	50	30*
29	23	9	50

OCTOBER.

Emerſions.

3	12	29	1
7	1	48	7
10	15	7	1
14	4	25	51
17	17	44	28
21	7	2	57*
24	20	21	16
28	9	39	23
31	22	57	20

NOVEMBER.

Emerſions.

4	12	15	0
8	1	32	38

D.	H.	M.	S.
11	14	50	4
15	4	7	19
18	17	24	20
22	6	41	17*
25	19	57	58
29	9	14	31

DECEMBER.

Emerſions.

2	22	31	6
6	11	47	29
10	1	3	51
13	14	20	10
17	3	36	28
20	16	52	50

Jupiter and the Sun in Conjunction.

ECLIPSES *of the third Satellite of* JUPITER.

JANUARY.

Immerſions.

7	10	42	50
14	14	39	17
21	18	36	23*
28	22	34	3

Emerſions.

21	21	35	15
29	1	33	45

FEBRUARY.

Immerſions.

5	2	32	25
12	6	31	16
19	10	30	42
26	14	30	29

Emerſions.

5	5	32	57
12	9	32	38
19	13	32	54
26	17	33	31*

MARCH.

Immerſions.

5	18	30	45
12	22	31	9
20	2	31	36
27	6	32	1

Eclipses *of the third Satellite of* Jupiter.

D.	H.	M.	S.
	Emerſions.		
5	21	34	37
13	1	35	51
20	5	37	6
27	9	38	19
	April.		
	Immerſions.		
3	10	32	9
10	14	32	5*
17	18	31	43
24	22	30	54
	Emerſions.		
3	13	39	15*
10	17	39	59
17	21	40	25
25	1	40	24
	May.		
	Immerſions.		
2	2	29	49
9	6	28	17
16	10	26	22
23	14	24	11*
30	18	21	40
	Emerſions.		
2	5	40	5
9	9	39	19
	June.		
	Immerſions.		
6	22	19	8
14	2	16	38
	Jupiter and the Sun in Oppoſition the 19th Day.		
	Emerſions.		
21	9	29	51*
28	13	28	34*
	July.		
	Emerſions.		
5	17	27	55
12	21	27	51
20	1	28	17
27	5	29	18
	August.		
	Immerſions.		
3	6	11	24
10	10	12	47*
17	14	14	44
24	18	16	57
31	22	19	30
	Emerſions.		
3	9	30	54*
10	13	32	57
17	17	35	34
24	21	38	27
	September.		
	Immerſions.		
8	2	22	13
15	6	24	57*
22	10	27	32*
29	14	29	52
	Emerſions.		
1	1	41	40
8	5	45	3
15	9	48	25*
22	13	51	36
29	17	54	30
	October.		
	Immerſions.		
6	18	31	45
13	22	33	5
21	2	33	46
28	6	33	49*
	Emerſions.		
6	21	56	55
14	1	58	45
21	5	59	56*
28	10	0	29

Novem-

ECLIPSES *of the third Satellite of* JUPITER.

D.	H.	M.	S.
		NOVEMBER.	
		Immerſions.	
4	10	33	19
11	14	32	53
		Emerſions.	
4	14	0	29
11	17	59	33
18	21	58	3
26	1	55	50
		DECEMBER.	
		Immerſions.	
		Emerſions.	
3	5	53	4*
10	9	50	5
17	13	46	53

Jupiter and the Sun in Conjunction.

ECLIPSES *of the fourth Satellite of* JUPITER.

JANUARY.

Immerſions.				Emerſions.			
8	2	39	58	8	4	41	4
24	20	32	47	24	22	46	1

FEBRUARY.

10	14	28	46	10	16	55	6*
27	8	29	57	27	11	5	25

MARCH.

16	2	32	19	16	5	16	59

APRIL.

1	20	35	36	1	23	28	58
18	14	37	13*	18	17	39	35

MAY.

5	8	38	5	5	11	47	29*
22	2	36	4	22	5	54	32

ECLIPSES *of the fourth Satellite of* JUPITER.

D.	H.	M.	S.		D.	H.	M.	S.
				JUNE.				
Immerſions.					Emerſions.			
7	20	33	55					
Jupiter and the Sun in Oppoſition.								
				JULY.				
28	2	37	51		11	12	12	25*
					28	6	23	1
				AUGUST.				
13	20	45	43		14	0	36	49
30	14	56	16		30	18	52	56
				SEPTEMBER.				
16	9	7	56*		16	13	9	52
				OCTOBER.				
3	3	18	56		3	7	25	50*
19	21	27	43		20	1	39	17
				NOVEMBER.				
5	15	33	11		5	19	49	1
22	9	35	37		22	13	54	31
				DECEMBER.				
9	3	34	12		9	7	57	50
Jupiter and the Sun in Conjunction.								

N. B. *Thoſe marked with a Star, are viſible at* London.

III. *The*

III. *The Caſe of a Man who was poiſon'd by eating* Monks-hood *or* Napellus, *communicated to the* Royal Society *by Mr.* Vincent Bacon, *Surgeon, F. R. S.*

ON *Monday* night laſt, being *February* the 5th, about Ten, I was called in haſt to one *John Crumpler*, a *Silk-Weaver*, in *Spittle-Fields*; when I came into the Room, I found him lying on the Bed, his Head ſupported by a By-ſtander, his Eyes and Teeth fixed, his Noſe pinched in, his Hands, Feet, and Forehead cold; and all covered with a cold Sweat, no Pulſe to be perceived, and his Breath ſo ſhort as ſcarce to be diſtinguiſhed: Enquiring into the Caſe, I was told that he had been very well all Day, and about Eight had eaten a very hearty Supper of Pork, and a Sallad dreſt with Oil and Vinegar; and though he was very merry at his Meal, he began immediately after to find an Indiſpoſition: I asked of what the Sallad was compoſed? and was anſwered, that there were in it nothing but common Sallad Herbs, all which they bought at a Stall in the Market, except ſome Celery, which they had picked out of their own Garden. Suſpecting that he had been eating ſome poiſonous Herb, I asked if he found in the beginning of the Diſorder any inclination to Vomit? They ſaid no, but that when he found his Illneſs come upon him with great Violence, he believed himſelf to be poiſoned, and forthwith drank a large quantity of Oil, not leſs than a Pint in all, and after that he loaded his Stomach with Carduus-Tea 'till he vomited,

ed; and though he threw up the greateſt Part of his Supper, yet the Symptoms ſtill encreaſed, which made them ſend for me; but before I could get to him, things were come to the Extremity above deſcribed. Having nothing at hand but a Tea ſpoonful or two of Spirit of *Hartſhorn*, I forced open his Teeth with the Handle of a Spoon, and as his Head was reclined, I poured the Spirit into his Mouth, which a little rouſed him, and firſt ſet him a Coughing, and next a Vomiting; I took the Advantage of the little Senſe that was returned, and continued plying him with Carduus-Tea 'till he had vomited ſeveral times more, but I could not hinder his Swooning often between the Times of reaching, though I gave him after each forty or fifty Drops of *Sal Volatile & Tinctur. Croc. aa. p. æ* (which I had ſent for) in a Glaſs of Wine; he at length began to find a Working downwards, as he afterwards expreſſed himſelf, which was followed by a Stool; after which he vomited two or three times more, and then ſaid his Head was ſo heavy, and his Strength and Spirits ſo exhauſted, though his Stomach and Bowels were much eaſier, that he muſt needs lie down: His Pulſe was then a little returned, though very much interrupted and irregular, ſometimes beating two or three Strokes very quick together, and then making a Stop of as long or a longer Time than the preceeding Strokes altogether took up. Having obſerved that what he had laſt vomited was little more than the pure Carduus-Tea, I then gave him a Draught made of *Aq. Epidem. Ther. Androm. Conf. Alkermes.* &c. and gave Orders to make him ſome Sack-whey to drink between whiles, ſometimes alone, and in caſe of great Faintneſs with ſome of the above-named

named Drops. It being near One o' Clock, I left him, and calling to ſee him on *Tueſday* in the Forenoon, found him much amended: He had lain awake, tho' ſtill, an Hour or two after I left him, but being very cold and chilly, had a great deal of Covering laid on him, and then found a kindly Warmth come over his Limbs, which was ſucceeded by a moderate Sweat, and then a quiet Sleep of four or five Hours, from which he awaked very much refreſhed; and when I was there, was capable of anſwering the Queſtions I asked him, I mean with regard to Strength; for his Senſes had never failed him but during the Swoonings. I wanted to ſee ſome of the Sallad, but was told that they had eaten all that they picked, and the reſt was thrown upon the Fire, ſo that nothing could be ſeen but the Celery, which being the Produce of their own Garden, the Boy who gathered it the Evening before, was ordered to fetch ſome more of the ſame; he preſently brought a Specimen, which I took to be the common *Monks-hood* of our Gardens, called by *Moriſon* in his *Prælud. Botan. Aconitum Spicâ Florum pyramidali*. But that this Company may be more certain, I have brought a Specimen of the Plant taken from the ſame Place this Morning, which the Boy ſays is of the ſame Kind which he gathered before, and the Patient upon biting it, declares to have the ſame Taſte which he perceived on *Monday*. But it may be obſerved, that it was not then ſo much ſhot up into Leaves as it is now: I deſired him to give me an exact account of what Alterations he found in himſelf after the eating it, and how they came on: He ſaid the firſt Symptom was a Senſation of a tingling Heat, which did not only affect his Tongue, but

his

his Jaws, ſo that the Teeth ſeemed looſe; and his Cheeks were ſo much irritated, that the People about him, nay even his Looking-Glaſs could ſcarce perſuade him but that his Face was ſwelled to twice its proper ſize; this tingling Senſation ſpread it ſelf farther and farther, 'till it had taken hold of his whole Body, eſpecially the Extremities; he had an Unſteadineſs in the Joints, eſpecially of the Knees and Ancles; with Twitchings upon the Tendons ſo that he could ſcarce walk a-croſs the Room, and he thought that in all his Limbs he felt a ſenſible Stop or Interruption in the Circulation of his Blood, and that from the Wriſts to the Fingers ends, and from the Ancles to the Toes there was no Circulation at all; but he had no Sickneſs or Diſpoſition to Vomit 'till he took the Oil, &c. Afterwards his Head grew giddy, and his Eyes miſty and wandring, next a kind of humming or hiſſing Noiſe ſeemed continually to ſound in his Ears, which was followed by the Syncopes above recited.

There ſupped with him two Women the ſame Night; one of them happened to have a diſlike to Celery, and therefore laid a-ſide all that ſhe took for ſuch, the other having before been out of order, and was not then perfectly recovered, eat but ſparingly, but took this ſuppoſed Celery along with the other Herbs; and felt, and complained of all the ſame Symptoms, but in a leſs Degree than the Man had done. She would not be prevailed on to Vomit, but only took the Cordial-Draught above deſcribed. I ſaw them both this Morning, the Man is quite well, but the Woman is ſtill out of order.

They

They ſay that there was not put into the whole Sallad, more than what grows upon one of theſe Roots.

Feb. 8*th*, 1732.

IV. *Deſcriptio* LUMINUM BOREALIUM *Vitembergæ Anno* CIↃ IↃCC XXXII. *conſpectorum. Auctore* Joh. Frider. Weidlero *LL. D. Matheſ. Profeſſ. Primar. Vitemberg. R. S. S.*

ANNO 1732, die 18 Febr. St. V. circa horam IX veſpertinam ſereno cœlo aurora borealis enituit. Nimirum ſub ſeptemtrionibus arcus ater 20 gradibus parte ſui media elevatus hora IX conſpectus eſt, cum paulo ante eadem veſpera cœlum ibidem ſerenum fuiſſet notatum. Imminens atro illi arcui cœli regio candida erat, atque ex hac ſubinde erumpebant ſolitæ luminis borei radiationes, ſive pyramides luminoſæ, tum etiam vapores candidi pertenues, qui inſtar nubecularum celeri motu verſus verticem ferebantur.

Hora X aliquamdiu ceſſare motus materiæ luminoſæ videbatur; mox tamen vapores albi undarum ſpecie iterum ex alba illa cœli regione prodibant: imago autem tentorii prope verticem viſa non fuit.

Hora x. min. 30. alba arcus caliginoſi faſcia dilatabatur, ſed vapores lucidi inde parciùs exibant.

Pyramides lucidæ utrimque prope Septentrionis cardinem enaſcebantur. Vapores vero fluctuantes verſus occaſum erant frequentiores. Aer perpetuo tranquillus erat.

Anno 1732, die 12 Octobris, St. V. ſtatim poſt horam VI veſpertinam iterum eluxit aurora borealis. Nempe arcus caliginoſus inter NNW. & NE. expandebatur. Supra eum clara eminebat cœli regio, circiter 10 gradus lata, non accurate arcus figuram exprimens. Latior portio in occaſum a cardine Septentrionis 10 circiter gradibus declinabat; atque hinc, tanquam ex materiæ lucentis fonte, hora VI, min. 30, exibant plurimæ candidæ pyramides, quæ fere ipſum Zenith aſſequebantur: nonnullæ ex iis rubebant, citoque evaneſcebant, una earum in Zenith uſque, inter coronam & Herculem porrecta diutius ſubſiſtebat, unam tantum radiationem verſus N E obſervavi. Intra quadrantem horæ hic luminum borealium luſus finiebatur. Nubes, quæ antea verſus occaſum hærebant, auſtro impulſæ diffundebantur & in ortum contendebant. Sub illis tamen verſus ortum remanebat lucida regio, & arcus niger infra horizontem condebatur, arcus candidus nigro imminens una cum nubibus infra horizontem deſcendebat, & diſſipatâ tum caligine, tum nubibus tenuibus hora VII cœlo undiquaque ſerenitas reddebatur. Tota tamen nocte lumen tenue partem horizontis ſeptentrionalem occupavit.

Præter hæc, quæ ipſemet contemplatus ſum, lumina borealia etiam alia minus ſplendida luxiſſe dicuntur, Diebus 10 Martii, 13 Aprilis, 11 Auguſti, 30 Auguſti, St. V. ſed de phænomenis eorum ſingularibus nihil certi habeo compertum.

Cæterum his aliiſque, quas ſuperioribus annis cepi, illius Lucis obſervationibus, magis magiſque moveor ut credam, habere eam omnino ſedem ſuam circa polum magneticum, vel ſaltem inde ejus motum

tum quodammodo regi & determinari, quod pro ſumma, qua pollet, ingenij ſagacitate perſpexit primus illuſtris Halleius.

De effectu auroræ borealis nondum ſatis luculenter conſtat. Tantum illud notavi, nunquam non unum pluresve dies perquam ſerenos illius deflagrationem proxime ſubſequi. Sueci Norwegique, quibus ſæpius hoc phænomenon apparet, longa experientia didiciſſe dicuntur, quod lux borea, quando circa autumni initium frequentius exſplendeſcit, temperatiorem auram & largam meſſem promittat, quapropter auroram borealem vulgari ſermone, Kornmod, ſive ſegetis maturationem appellant. Iidem auroras Septentrionales hibernas, ſæpe recurrentes, pro frigoris aſperioris indicio prælagiove habent, quemadmodum narrat D. Leopold in relatione epiſtolica de itinere ſuo Suecico ad V. CL. Joan. Woodwardum, p. 19. Edit. Londini, A. 1720. Priori hypotheſi conformia ſunt experimenta, autumno Anni 1731, noſtro in Climate capta. Menſe enim Octobri illius Anni diebus IV, VII, VIII, X, XXIII. St. N. Lumen boreale & frequentiſſimum & ſplendidiſſimum notavimus, idemque poſtea tempeſtas adeo opportuna frugibus excepit, ut ditiſſimos agrorum hortorumque proventus Anno 1732, collegerimus.

V. *Narratio de* Erucarum & Locuſtarum, *quæ agros Vitembergæ vicinos aliquot abhinc Annis vaſtarunt, interitu, Auctore* Joh. Frid. Weidlero, *R. S. S.*

EX obſervationibus ſingularibus Anni 1732, commemoratione dignum eſt exitium erucarum & locuſtarum, quæ abhinc pluribus annis, in boreali circuli Saxonici tractu, in Marchia Brandenburgica & Luſatia, & forſan aliis quoque in locis, fruges miſerandum in modum depaverunt. Utrumque inſecti genus Vere Anni 1732, incredibili multitudine ex ſeminibus ſuis excluſum prodibat. Erucæ mox folia tam ſylveſtrium quam frugiferarum arborum, multis in locis tantum non omnia exedebant; locuſtæ quoque maxima, quæ præterlapſis Annis dederant, damna frugibus iterum minabantur. Itaque ruricolæ fovcas paſſim laborioſiſſime facere, & locuſtas, nondum ſat validis ad avolandum alis inſtructas in eas congregare, eaſque injecta terra obruere atque interficere cœperunt. Sed hæc pauperum colonorum ſolertia parum erat profutura, niſi optimi maximi numinis beneficio, tempeſtatis quibuſdam incommodis hæc inſecta ſic fuiſſent fatigata atque enervata, ut omnia ineunte æſtate, antequam ſemina nova potuiſſent deponere, brevi tempore perirent. Scilicet; poſtquam blandus ſolis calor, circa menſis Aprilis St. V. principium maturius utrumque inſectum e nidis ſuis evocaverat, mox frigus aliquot noctium vehementius, e. g. d. 15, 16, 17, 18 Aprilis, St. V. tum quoque imbres frigidi largiſſimique, d. 22, Aprilis & 19 Maij, & deinceps etiam pluviæ ferme quotidianæ copioſiſſimæque circa finem Maij, & magna

magna parte menſis Junij & Julij ſequebantur, hiſque ex cauſis evenit, ut noxia hæc animalcula nec molis corporis ſui, nec virium ſolita capere poſſent incrementa. Itaque erucæ & locuſtæ circa menſis Junij initium, exilia adhuc corpora, nec juſtam membrorum menſuram, in quam circa hoc anni tempus alias excreverant, habuerunt. Locuſtæ ſigillatim, humoris quippe impatientes, ineunte menſe Julio, mortuæ paſſim in agris repertæ ſunt, plurimæque earum, quæ ne imbrium aquis mergerentur, in longiores herbarum florumque caules inſilierant, iiſdemque oribus firmiter adhæſerant, ex his exanimes pependerunt. Hanc interitus locuſtarum non improbabilem eſſe cauſam, inde luculenter ſatis intelligitur, quia experientia docuit, hoc inſecti genus agros tantum editiores & ficciores tenuiſſe ibidemque etiam nidulatum eſſe, valles autem humiles ſemper devitaſſe. De figura harum locuſtarum ſilendum non eſt, eas diverſam præ ſe tuliſſe ſpeciem a viridibus illis quæ quotannis, ſed parvo numero in pratis agriſque conſitis obviæ ſunt. Capitis nempe & tergi color niger nonnullarum etiam griſeus erat, qui punctis flavis interſperſis tanquam maculis diſtinguebatur; Venter flaveſcebat, pedum poſteriorum muſculi rubebant, & cum volarent, purpureum colorem referebant. Longitudo corporis plerarumque ſeſquipollicem non ſuperabat, notavi tamen A. 1731, M. Auguſto, aduſtas quaſdam duobus pedis geom. digitis longiores. Eodem menſe mas & fœmina coibant, ovula pluſquam triginta unus venter geſtabat. Ovula poſuere in foraminibus in terra factis, iiſque matres immortuæ ſunt, finiente menſe Septembri. Narratum mihi eſt eas, cum primum ante qua-

quadriennium ex Polonia per Luſatiam & Marchiam huc appellerent, media æſtate catervatim alte in aëre ſupra ædes turreſque advolaſſe, ut eminus nubis ſpeciem mentirentur. Quo conſederunt loco, ibi terram omnem operuerunt, atque inde longe lateque diffuſæ fuerunt. De damnis quæ pernicioſiſſimum hoc inſectum vicinis Vitembergæ campis editioribus, nam in ipſam vallem prope Vitembergam locuſtæ non penetrarunt, ſed in collibus, qui 1500 circiter paſſibus geometricis ab hac urbe abſunt, ſubſtiterunt, & inde ulterius verſus Marchiam & Luſatiam proceſſerunt, attulit, ni fallor, in excerptis obſervationum Anni 1731 retuli. Amabant ſupremas ſpicarum molliores cuſpides, queis ut commodius fruerentur, totam ſpicam immaturam decerpebant, idque noctu inprimis fiebat. Una ſæpe nocte pleraſque integri jugeri ſpicas ſic in terram proſtratas a locuſtis fuiſſe fide digni viri mihi confirmarunt, quapropter nonnullis in pagis ne ſementem quidem pauperes coloni ex agris ſuis collegerunt.

VI. *Clauſula excerpta*, ex Hiſtoriâ Variolarum quæ per Inciſionem excitantur, *ab* E. Timoni, *M D. Scriptâ*, *R. S. Communicavit* Sam. Horſeman, *M. D.*

FUIT primò nonnullus qui novaculâ cutim ſcindebat, eique Variolarum includeret tubercula exiccata, factâ deſuper ligaturâ: Sed præter dolorem, qui tamen in pueris reluctantibus multum difficultatis adfert, talis Operatio non benè ſucceſſit.

Ali-

Aliquando enim tardè & cum peſſimorum Symptomatum Satellitio erupere variolæ; aliquando incaſſum ceſſit Inciſio; illa tamen loca Inoculationis ulceribus cacoetheis repleta fuerunt. Nonnullis etiam lethalis fuit talis Operatio: Mumia enim fermentativa, e marcidis iſtis tuberculis, rancidâ ac veluti cadaverizata non ſolum expetito ſcopo haud ſatisfacit, ſed pravam ſanguini poteſt communicare putrilaginem.

VII. *An Abſtract of a Letter from* Petrus Van Muſchenbroek, *M. D. F. R. S. Profeſſor of Mathematicks and Aſtronomy in the Univerſity of* Utrecht, *in* Holland; *to Dr.* J. T. Deſaguliers, *F. R. S. concerning Experiments made on the* Indian Magnetick-Sand.

SIR,

I Don't know whether I dare take up your Time with my Trifles; yet I'll venture for once to acquaint you with ſome things concerning the *Indian-Sand*, which is attracted by the Loadſtone.

The *Indian-Sand* which is brought to *Holland*, is ſaid to be chiefly gather'd upon the Sea-ſhore in *Perſia*; then it is boiled in Water, to free it from its Saltneſs, and it is after this a black Powder, conſiſting of Grains of different Bigneſs; ſome of which have a very rough Surface, and others have one part of their Surface ſomething rough, and the other very ſhining: Their Figure is very irregular, like Grains of com-

common *Sand*, only this *Indian-Sand* is ſmaller. Theſe little Lumps have neither Taſte nor Smell, and are friable, ſo as to be eaſily reduc'd to a very ſubtile Powder. It has ſome Parts, which are ſtrongly attracted by the Loadſtone; and others ſo very inactive, as ſcarcely to ſeem to be magnetical: the ſtrongeſt are the blackeſt; but the inactive ones are more ſhining, and more inclining to the Colour of Lead; theſe are in the greateſt Quantity, and from them the others are got out by a Loadſtone. The Ingenious *Moutenus* has examin'd ſeveral ways ſuch a kind of *Sand* which is brought from *Virginia*, and deſcrib'd it in the *Philoſ. Tranſ.* N° 197. I have examin'd the *Indian-Sand* another way; of which, I have given an Account in my *Phyſical Diſſertations*, pag. 127; but a great deal ſtill remain'd to be conſidered, and as there is a great deal more of this Subſtance of the Lazy or Inactive, than of the Active or Magnetick ſort, it was proper to try whether a Magnetick Virtue might not be excited or increaſed in all of it; and after a few Trials I found the Thing to ſucceed. I ſuſpected that there might perhaps be too great a quantity of Sulphur adhering to the *Sand*, to ſuffer it to be turn'd into any Metalline Regulus by a long Continuance in the Fire; therefore, I toaſted it in an open Crucible for two Hours with half the quantity of Pot-aſh; afterwards I waſhed away the Salt with Water, and the *Sand* remain'd much blacker than before, of which I found more than a Quarter endued with a greater Magnetick Force. I do not ſcruple to attribute this Virtue to the Salt; becauſe, tho' the Action of the Fire alone does encreaſe the Force of the *Sand*,

yet

yet it does not give it near ſo much attractive Force.

Becauſe common black Soap is made of Oil boiled with a Lixivium of Pot-aſh, I had a mind to try whether Soap might not do more than Salt alone in raiſing the Virtue in the *Sand*; ſo I mix'd the *Sand* with an equal quantity of Soap, which I firſt expos'd to a gentle Fire in an open Crucible, to dry up the Soap which ſwells very much; then the Fire was encreas'd for three quarters of an Hour, all the oily Subſtance wholly conſum'd, and the Matter in the Crucible was ſtrongly fir'd; then afterwards boiling it in Water, and waſhing it well, I obtain'd a black *Sand*, which was all endued with a lively attracting Force. Very well pleas'd with this Succeſs, I had a Mind to try whether I might raiſe a greater Force in it; wherefore I again roaſted it with black Soap as before, and even a third Time; but no Addition was thereby made to its Virtue: I find that ſtaying too long in the Fire is as prejudicial as ſtaying too ſhort a Time, between half an Hour and an Hour ſeem'd to me the moſt proper ſpace of Time.

After, I added to the black Soap half of Salt of *Tartar*, and mix'd thereto an equal quantity of *Sand*; which, when it had been expoſed to a reverberatory Fire $\frac{1}{4}$ of an Hour in a Crucible, I waſh'd in Water; and then ſo great was the Virtue of the *Sand*, that if it did not exceed the former, at leaſt it was equal to it.

Becauſe I had obſerv'd the Oilineſs of the Soap to conduce much to excite the Vertue in the *Sand*; I

mix'd Beef-Tallow with an equal quantity of *Sand*, and having very well clos'd the Crucible, I expos'd the whole Mass to a reverberatory Fire for two Hours, whereby the *Sand* became much blacker, and receiv'd a great deal of attractive Virtue: but that *Sand* became much more active which was burn'd two Hours with an equal quantity of Pitch, as likewise very black, subtile, and very little shining: but when it was exposed a longer Time in the same Crucible, I observ'd it to be weaker; as also, when it was in the Crucible with the Pitch but $\frac{1}{8}$ of an Hour, it scarce acquir'd any Virtue; so that there must be a determin'd Action of Fire to raise the Vertue in the *Sand*. Yet I cou'd not raise a greater Virtue in the *Sand* than by the means following, *viz.* mixing the *Sand* in the Crucible with equal parts of Rosin, Pitch, Frankinsence, and Rape Oil, and exposing it to a reverberatory Fire for an Hour, having first well clos'd up the Crucible. Between the black Coals of the oily Matter, there sticks a very black *Sand*, which leaps up swiftly to the Loadstone, as soon as it is brought near it. Then I consider'd whether the *Sand* did not acquire the greatest Force as it came nearer to the Nature of Steel, by burning it with the Bodies abovemention'd; and suspecting this, in order to try it, I put it among such Bodies as turn Iron into Steel, according to the Operations describ'd by that great Experimenter Monsr. *Reaumur*, in that excellent Book, entitluled, *The Art of turning Iron into Steel*. I took therefore three parts of *Sand*, two parts of Chimney-Soot; and of Sea-Salt, Powder'd Charcoal, and Ashes, one Part each. Having accurately

curately mix'd all theſe Bodies together, they were expos'd for ſix Hours in a cloſe Crucible to a ſtrong Fire; and then the whole Maſs was boil'd and waſh'd in Water, then dried, and ſo received a great deal of attracting Force; but it was not near ſo active as that which was prepar'd with Soap, or in the manner laſt deſcrib'd.

And now, what can this *Sand* be? Is it an imperfect Magnet, or ſubtile Powder of it, which when it is grown up into a greater Lump, makes the vulgar Loadſtones? So I conjectur'd at firſt; but when I found by Experience that common Loadſtones expos'd to the Fire, according to ſome of the Methods abovemention'd, did rather loſe of their Force than gain, I alter'd my Opinion; and now confeſs that I have not yet penetrated into the Knowledge of the Nature of this Matter.

Whatever it be, it is certain that there are ſevera kinds of this *Sand*, brought from different Countries of the Earth: For it is brought from *Perſia*; ſome is brought from *Virginia*; there is another ſort in *Italy*, which is common enough at *Leghorn*, and this laſt is naturally very attractive; there are two ſorts found in the *Eber*, a River of *Haſſia*; of which, one is like the *Italian*, and the other conſiſts of large Grains, almoſt as big as Hemp-Seed, but ſcarce having any Virtue. I have beſides a very ſtrong Sort, which I am told was got near old *Raguſa* in *Dalmatia*. No Body knows how many kinds of this *Sand* there are: that Time, and the diligent Obſervations of Philoſophers muſt hereafter ſhew.

I herewith ſend you a little Box, containing one Paper with the natural *Sand*; another, the *Sand* after

having burn'd it with Soap in the manner deſcrib'd. It is no Treaſure; but if you have none of it, it may be worth your Acceptance.

I am, Sir,

Utrecht, Jan. 15th, 1733. O. S.

Your, &c. &c.

Petrus Van Muſchenbroek.

VIII. *An Account of ſome Obſervations made in* London, *by Mr.* George Graham, *F. R. S. and at* Black-River *in* Jamaica, *by* Colin Campbell, *Eſq*; *F. R. S. concerning the* Going of a Clock; *in order to determine the Difference between the Lengths of* Iſochronal Pendulums *in thoſe Places. Communicated by* J. Bradley, *M. A. Aſtr. Prof. Savill.* Oxon. *F. R. S.*

ALtho' it is now above Sixty Years ſince Mr. *Richer* firſt diſcovered, that Pendulums of the ſame Length, do not perform their Vibrations in equal Times in different Latitudes; and tho' ſeveral Experiments made ſince in different parts of the Earth concur to prove, that Pendulums ſwinging Seconds are in general ſhorter as we approach the Equator; yet what the real Difference is between their Lengths in different Latitudes, does not ſeem to have been determined with ſufficient Exactneſs,

by

by the Obſervations that have hitherto been communicated to the Publick; as may be gathered from the 20th Propoſition of the third Book of Sir *Iſaac Newton's Principia*, where they are compared as well with each other, as with the Theory of that illuſtrious Author. It were therefore to be wiſhed, that more of this kind of Experiments could be made with greater Accuracy in proper Places, by ſuch Perſons as have ſufficient Skill and Opportunities to do it; that we might thereby be enabled to judge with more Certainty, concerning the true Figure of the Earth, and the Nature of its conſtituent Parts.

As an Inducement to ſuch as may have it in their Power to put the like again into Practice; I ſhall lay before the Society, an Account of a very curious Experiment of this ſort lately made in *Jamaica*, by our worthy Member *Colin Campbell*, Eſq; whoſe Knowledge and Abilities in every reſpect qualifies him for the Improvement of Arts and Sciences; and whoſe Genius prompts him to cultivate them ſo aſſiduouſly, that I doubt not but we ſhall ſoon have the Satisfaction of receiving many other valuable Obſervations from him, particularly ſuch as relate to Aſtronomy; he having furniſhed himſelf with an Apparatus of Inſtruments not unworthy the Obſervatory of a Prince. Among theſe is a Clock whoſe Penduluin vibrates Seconds, made by our ingenious Member Mr. *George Graham*, juſtly eſteem'd for his great Skill in Mechanicks; who judging that an Opportunity was now offered of trying with the utmoſt Exactneſs, what is the true Difference between the Lengths of Iſochronal Pendulums at *London* and *Jamaica*,

maica, readily embraced it; and in framing the Parts of the Clock, carefully contrived, that its Pendulum might at pleaſure be reduced to the ſame Length, whenever there ſhould be occaſion to remove the Clock from one Place, and ſet it up in another.

This Clock being chiefly deſigned for Aſtronomical Obſervations, had no ſtriking Part, and its Pendulum was adjuſted to ſuch a Length, that in *London* it vibrated Seconds, of Siderial, and not of Solar Time. When it was finiſhed, Mr. *Graham* fix'd it up in a Room ſituated backward from the Street, and on the Northſide of his Houſe, to prevent its being diſturbed by Coaches, or other Carriages that paſſed thro' the Street, and that it might be as little effected by the Sun as poſſible. Having ſet it going, he compared it with the Tranſits of the Star *Lucida Aquilæ* over the Meridian, which paſſed

	th		h.	′	″	
	20	at	8	59	15	
	22	at	8	59	18	
	23	at	8	59	20½	
Auguſt,	25	at	8	59	22	by the Clock.
1731.	28	at	8	59	25½	
	29	at	8	59	26	
	30	at	8	59	27	

Hence it appears, that the Clock gain'd twelve Seconds in ten Apparent Revolutions of the Star.

In order to eſtimate how much the Pendulum may be lengthened by greater Degrees of Heat, or how much ſlower the Clock would go on that Account, when

when removed into a warmer Climate, a Thermometer was fixed by the ſide of it; and between the Hours of Ten and Eleven in the Morning, and at Night, notice was taken at what Height the Spirits ſtood, and the mean Height for each Day was as follows.

th	*Therm.*	
21	32¼	Diviſions.
22	30¼	
23	28¼	
24	27½	
Auguſt, 25	28½	Hence the mean Height
1731. 26	27¼	for all theſe Days was
27	27½	about 28½ Diviſions.
28	27½	
29	27½	
30	27¼	

The Clock-weight that keeps the Pendulum in Motion is 12 *lb.* 10½ *oz.* and is to be wound up once in a Month. The Weight of the Pendulum itſelf is ſeventeen Pounds, and (during the Time that the Clock was compared with the Tranſits of the Star) it vibrated each way from the Perpendicular 1° 45′. The Magnitude of the Vibrations was eſtimated by means of a Braſs Arc, which was fixed juſt under the lower end of the Rod of the Pendulum, and divided into Degrees, *&c.*

Auguſt 31, Mr. *Graham* took off the Weight belonging to the Clock, and hung on another of 6 *lb.* 3 *oz.* and with this Weight the Pendulum vibrated only 1° 15′ on each ſide; and the Clock went one

Second

Second and an half ſlower in 24 Hours, than when its own Weight of 12 *lb.* 10½ *oz.* was hung on.

This Experiment ſhews, that a ſmall Difference in the Arcs deſcribed by the Pendulum, or a ſmall Alteration in the Weight that keeps it in Motion, will cauſe no great Difference in the Duration of the Vibrations; and therefore a little Alteration in the Tenacity of the Oil upon the Pivots, or in the Foulneſs of the Clock, will not cauſe it to accelerate, or retard its Motion ſenſibly; from whence we may conclude, that whatever Difference there ſhall appear to be, between the going of the Clock at *London* and in *Jamaica*, it muſt wholly proceed from the lengthening of the Pendulum by Heat, and the Diminution of the Force of Gravity upon it.

A particular written Account of the Obſervations and Experiments hitherto taken Notice of, was delivered to me by Mr. *Graham* in *September*, 1731; about the ſame Time the Clock was put on Shipboard to be carried to *Jamaica*. He likewiſe ſent very full Directions to Mr. *Campbell*, deſcribing in what manner the Clock was to be fixed up, and how the Pendulum might be reduced exactly to the ſame State as it was when in *England*; but no Intimation was given concerning the going of the Clock, that the Experiment might be made with all poſſible Care, and Caution, and without any Byaſs, or Prejudice, in favour of any Hypotheſis, or former Obſervations.

In *July* 1732, we received an Account of the Succeſs of the Experiment, by the Hands of Mr. *Joſeph Harris*, who was preſent at the making of it in *Jamaica*, whither he went the Year before with

with Mr. *Campbell*, in order to assist him in his Design of erecting an Observatory for the Improvement of Astronomy, and the Promoting other parts of Natural Knowledge in that Island: But his ill State of Health obliging him to return into *England*, he brought with him the Original Journal of the Observations of the Transits of two Stars (*viz. Syrius* & β *Canis Majoris*) over the Meridian, compared with the Clock, after it was fixed up in *Jamaica*, as Mr. *Graham* had directed; together with the Height of the Spirits of the forementioned Thermometer, upon the several Days of Observation.

The chief of those Observations are contained in the following Table, the First Column whereof shews the Day of the Month; the Second, the Name of the Star, and the Time by the Clock of its observed Transit over the Meridian; the Third contains the Hour of the Day, when the Thermometer was observed, together with the Height of the Spirits at those Hours; the Morning Hours being denoted by the letter A, and those of the Afternoon, by the Letter P.

1732	Canis Majoris.	Time of Transit.		Hour of Day.	Thermometer.
Jan.		h	′ ″	h	
23	β	11	59 50	10½ A	14¾
	α	12	22 14	9½ P	11
24	Cloudy.			11½ A	15¼
25	β	11	55 40	8½ A	17½
	α	12	18 4	9¼ P	11¼
Jan.		h	′ ″	h	
26	β	11	53 35	8 A	20
	α	12	16 00	2 P	8½
				9 P	10
27	β	11	51 31	7 A	17½
	α	12	13 55	2 P	8½
				9¾ P	12½

1732	Canis Majoris.	Time of Tranſit.		Hour of Day.	Thermometer.
		h	′ ″	h	
Jan. 28	β	11	49 26	7 A	20½
	α	12	11 51	2 P	11
				10 P	12
29	β	11	47 22	6½ A	19
	α	12	9 46	3 P	9
				9 P	11¼
30	Cloudy.			7 A	20½
				4 P	7
				11 P	13
31	β	11	43 12	7 A	20
	α	12	5 37	9 P	8½
Feb. 1	β	11	41 8½	10 A	18¾
	α	12	3 33	11 P	16
2	β	11	39 0	9½ A	17½
		12	1 23¼	2 P	9
				5 P	6
				9 P	8½
3	β	11	36 53	8½ A	19
				1 P	9½
				9 P	9
4	β	11	34 46	6¼ A	18
	α	11	57 11	12	9½
				9 P	8
5	β	11	32 40	7½ A	19¼
	α	11	55 5	3½ P	6
				8½ P	8
6	β	11	30 35	7 A	18½
	α	Cloudy.		4 P	7½
				8½ P	8
7	β	11	28 31	7 A	20½
	α	11	50 55	12	12
				8½ P	8½

1732	Canis Majoris.	Time of Tranſit.		Hour of Day.	Thermometer.
		h	′ ″	h	
Feb. 8	β	Cloudy.		6½ A	21½
	α	11	48 50	8½ P	8¼
9	β	11	24 20	9½ A	14
	α	11	46 44	8½ P	8
10	β	11	22 12½	7¼ A	16
	α	11	44 37	11½ A	10
				3¼ P	3¼
				8½ P	6
11	β	11	20 6	7½ A	16
	α	11	42 30	12	9¼
				8½ P	5¾
12	β	11	18 0	10 A	17½
	α	11	40 24	12	13
				8 P	5¾
13	Clouds.			9 A	17
				8 P	6
14	β	Cloudy.		7½ A	16
	α	11	36 15	12	11
				8 P	10
15	Clouds.			9 A	18
				12	13¾
				8½ P	7½
16	β	Cloudy.		8 A	14
	α	11	32 4	8 P	7
17	β	11	7 34	12	12
	α	11	29 59	8 P	6¾
18	β	11	5 29	12	12¼
	α	11	27 53		

The Pendulum, during this Interval, vibrated about 1° 52′ each way from the Perpendicular.

The

The Tranſits of the Stars over the Meridian, were obſerved with a Teleſcope, fix'd at Right Angles to an Horizontal Axis, whoſe Ends lay exactly Eaſt and Weſt; by the turning of which Axis, the Line of Collimation of the Teleſcope, was conſtantly directed in the Plane of the Meridian. This Inſtrument was daily adjuſted to a Mark, fix'd in the Meridian; and in the Journal, between the 2d and 3d of *February*, the following Remark was made.

N. B. *This Day was hotter than uſual, as appears by the Thermometer; and the Tranſit Inſtrument had loſt the Level a little, but after we had adjuſted it, it pointed exactly to our Meridian Mark, and therefore we are at a loſs for the Cauſe of this Difference in the Clock.*

From the foregoing Table it appears, that the Clock loſt 54′ 21″ in 26 Revolutions of the Stars; that is, about $2'.5''.11$ in one Revolution; the Difference from this Medium ſomewhat varying, upon account of a greater, or leſs degree of Heat on different Days.

The Mean of all the obſerved Heights of the Thermometer from *January* 26th, to *February* 18th, was about $12\frac{1}{2}$ Diviſions. Therefore, the Difference between the mean Heights of the Thermometer, at *Jamaica*, and *London*, during the Intervals of the reſpective Obſervations, was $15\frac{1}{2}$ Diviſions; the Spirits ſtanding ſo much higher in *Jamaica*, becauſe of the greater Heat in that Iſland.

That we might be able to judge, how much the different Degrees of Heat, correſponding to any Number of Diviſions upon this Thermometer, would cauſe

the Clock to go ſlower, by lengthening its Pendulum, Mr. *Graham* took Notice of the loweſt Point, to which the Spirits ſunk at *London* in the Winter, 1731; and the greateſt Height to which they roſe in the following Summer; and comparing the Motion of the Spirits in this Thermometer, with the Alterations in another made with Quickſilver, which he has for ſome Years made uſe of; he concluded, that at *London* the Spirits in this Thermometer would ſtand (*communibus Annis*) about 60 Diviſions higher in Summer than in Winter.

By ſeveral Years Experience, he has likewiſe found, that his Clocks (of the ſame ſort with Mr. *Campbell*'s) when expoſed, as uſual, to the different Degrees of Heat and Cold of our Climate, do not vary in their Motion above 25 or 30 Seconds in a Day.

From theſe Obſervations and Experiments therefore we may reaſonably conclude, that ſufficient Allowance will be made for the Lengthening of the Pendulum by Heat, if we ſuppoſe the Clock, upon that Account, to go one Second in a Day ſlower, when the Spirits of this Thermometer ſtand two Diviſions higher, and in the ſame Proportion for other Heights.

Admitting then, that the mean Height of the Thermometer, while the Clock was compared with the Stars at *Jamaica*, exceeded that at *London* between 15 and 20 Diviſions; if we allow 8, or 9 Seconds, upon that Account, the remaining Difference muſt be wholly owing to the Difference of the Force of Gravity in the two Places.

Upon comparing the Obſervations, it appears, that in one apparent Revolution of the Stars, the Clock went $2' 6''\frac{1}{2}$ ſlower in *Jamaica*, than at *London*; deducting

ducting therefore 8″½, on account of the greater Heat in *Jamaica*, there remains a Difference of 1′ 58″; which muſt neceſſarily ariſe from the Diminution of Gravity, in the Place neareſt the Equator.

I have allowed the Clock to have loſt ſomewhat more, on account of the Difference of Heat, than the mean Heights of the Thermometer may ſeem to require, upon a Suppoſition, that the total Heat of the Days, compared with the Cold of the Nights, bears a greater Proportion in *Jamaica*, than *London*; but if that Suppoſition be not admitted, then the Clock in *Jamaica*, muſt have gone rather more than 1′ 58″ in a Day ſlower than in *England*.

Mr. *Campbell's* Obſervations were made at *Black-River*, in 18°. North Latitude. Now if we ſuppoſe, with Sir *Iſaac Newton*, that the Difference in the going of the Clock, is owing to the greater Elevation of the Parts of the Earth towards the Æquator, it will follow from theſe Obſervations, and what is delivered by him in the 20th Prop. of the 3d Book of his *Principia*, that the Æquatorial Diameter is to the Polar, as 190 to 189; the Difference between them being 41½ Miles; which is ſomewhat greater than what Sir *Iſaac Newton* had computed from his Theory, upon the Suppoſition of an uniform Denſity in all the Parts of the Earth.

I ſhall not enter into the Diſpute about the Figure of the Earth, but at preſent ſuppoſe, with Sir *Iſaac Newton*, that the Increaſe of Gravity, as we recede from the Æquator, is nearly as the Square of the Sine of the Latitude; and that the Difference in the Length of Pendulums, is proportional to the Augmentation, or Diminution of Gravity. Upon theſe

Suppo-

Suppoſitions, I collect from the forementioned Obſervations, that, if the Length of a ſimple Pendulum (that ſwings Seconds at *London*) be 39.126 *Engliſh* Inches, the Length of one at the Æquator, would be 39.00, and at the Poles 39.206. And (abſtracting from the Alteration on account of different Degrees of Heat) a Pendulum Clock that would go true Time under the Æquator, will gain $3' 48''\frac{1}{4}$ in a Day at the Poles; but the number of Seconds which it would gain in any other Latitude, would be to $3'.48''\frac{1}{4}$ nearly, as the Square of the Sine of that Latitude is to the Square of the Radius: From whence it follows, that the Number of Seconds which a Clock will loſe in a Day, upon its Removal to a Place nearer to the Æquator, will be to $3' 48''\frac{1}{4}$ nearly, as the Difference between the Squares of the Sines of the Latitudes of the two Places to the Square of the Radius. Thus the Difference of the Squares of the Sines of $51°\frac{1}{2}$, and 18°, the Latitudes of *London*, and *Black-River* being to the Square of the Radius, as 118 to $228\frac{1}{4}$, the Clock will go $1' 58''$ in a Day ſlower at *Black-River* than at *London*, as was found by Obſervation.

It may be hoped, that Mr. *Campbell*'s Succeſs in this Experiment, and the little Trouble there is in making it, will induce thoſe Gentlemen who may hereafter carry Pendulum-Clocks into diſtant Countries, to attempt a Repetition of it after his manner; that is, by keeping or reſtoring the Pendulums of their Clocks to the ſame Length in the different Places, and carefully comparing them with the Heavens, and at the ſame Time taking notice of the different Degrees of Heat, by means of a Thermometer.

From

From a variety of ſuch Experiments, we ſhould be enabled to determine how far Sir *Iſaac Newton's* Theory is conformable to Truth, with much greater certainty than from thoſe Trials which are made by actually meaſuring the Lengths of ſimple Pendulums; becauſe a Difference of one hundreth Part of an Inch, in the Length of a Pendulum, correſponds to Eleven Seconds in a Day; and it being eaſy to obſerve how much a Clock gains, or loſes in a Day, even to a ſingle Second; it is certain, that by means of a Clock, compared in the manner abovementioned, we may diſtinguiſh a Difference (in the Lengths of Iſochronal Pendulums) of one Thouſandth Part of an Inch, or leſs; whereas it will be ſcarce poſſible to meaſure their true Lengths, without being liable to a greater Error than that. Beſides, by taking Notice how much a Clock gains, or loſes, upon the falling or riſing of a Thermometer, we can better allow for the different Degrees of Heat in this, than in the other Method of making the Experiment, by actual Meaſurement; ſince it may not be eaſy to determine how much the Meaſure itſelf, which we make uſe of, will be lengthened by different Degrees of Heat.

For theſe Reaſons, I eſteem Mr. *Campbell's* Experiment to be the moſt accurate of all that have hitherto been made, and propereſt to determine the Difference of the Gravity of Bodies in different Latitudes; and therefore I ſhall ſubjoin a Table, which I computed from it, containing the Difference of the Length of a ſimple Pendulum, ſwinging Seconds at the Æquator, and at every fifth Degree of Latitude, together with the Number of Seconds that a Clock would gain in a Day, in thoſe ſeveral Latitudes, ſuppoſing

it

it went true, when under the Æquator; by means of which any one may readily compare other the like Obſervations with his; and thereby diſcover whether the Alteration of Gravity in all Places be uniform, and agreeable to the Rule laid down by Sir *Iſaac Newton* or not.

The Latitude of the Place.	The Difference of the Length of the Pendulum in Parts of an *Engliſh* Inch.	Seconds gained by a Clock in one Day.	The Latitude of the Place.	The Difference of the Length of the Pendulum in Parts of an *Engliſh* Inch.	Seconds gained by a Clock in one Day.
Deg.	Inch.	Seconds.	Deg.	Inch.	Seconds.
5	0. 0016	1. 7	50	0. 1212	134. 0
10	0. 0062	6. 9	55	0. 1386	153. 2
15	0. 0138	15. 3	60	0. 1549	171. 2
20	0. 0246	26. 7	65	0. 1696	187. 5
25	0. 0369	40. 8	70	0. 1824	201. 6
30	0. 0516	57. 1	75	0. 1927	213. 0
35	0. 0679	75. 1	80	0. 2003	221. 4
40	0. 0853	94. 3	85	0. 2050	226. 5
45	0. 1033	114. 1	90	0. 2065	228. 3

IX. *A Continuation of an Account of an Eſſay towards a Natural Hiſtory of* Carolina, *and the* Bahama *Iſlands, by* Mark Catesby, *F. R. S. with ſome Extracts out of the Sixth Set; by Dr.* Mortimer, *R. S. Secret.*

ACcounts of the firſt five Sets, which compoſe the firſt Volume of this beautiful Work, have been given in N°. 415, 420, and 426, of theſe *Tranſactions*. The Author deſigns in this ſecond Volume to exhibit the *Fiſh*, *Reptiles*, *Quadrupeds*, and ſeveral ſorts of *Plants*; in the former Volume having treated chiefly of the *Birds* and *Trees*. This ſixth Set, or firſt Part of the ſecond Volume, contains the Figures and Deſcriptions of *Fiſh*. In Plate

1. *Umbla minor marina, maxillis longioribus.* vid. Sloane Hiſt. Jam. Tab. 247. fig. 3. The *Barracuda*. The Fleſh of this *Fiſh* is very unwholſome, and frequently poiſonous.

Vulpis Bahamenſis.

2. *Perca marina Gibboſa cinerea.* The *Margate-Fiſh*. This is eſteem'd very good Meat.

Saurus ex cinereo nigricans. The Sea *Sparrow-Hawk.*

3. *Perca marina, pinna Dorſi diviſa.* The *Croker*. This *Fiſh* is tolerable good Meat.

Perca marina rubra. The *Squirrel*. It is a good eating *Fiſh*.

4. *Perca marina, Rhomboidalis, faſciata.* The *Pork-Fiſh*. The *Bahamians* eſteem this a good *Fiſh*.

Perca marina, pinnis branchialibus carens. The School-maſter.

5. *Perca marina, venenoſa, punctata.* The *Rock-Fiſh.* This *Fiſh* is reckon'd the moſt poiſonous of any among the *Bahama* Iſlands. Many of theſe *Fiſh*, which are poiſonous in one Place, are not ſo in another; and tho' the Inhabitants can give a near Gueſs, yet they are ſometimes miſerably deceiv'd.

6. *Perca marina capite ſtriato.* The *Grunt.*

Albula Bahamenſis. The [*Bahama*] *Mullet.* It is eſteemed a good eating *Fiſh*, and is caught in great Plenty.

7. *Perca marina puncticulata.* The *Negro Fiſh.*

Perca marina, cauda nigra. The *Black-Tail.*

8. *Hirundo.* The *Flying-Fiſh.* The Wings with which it flies in the Air, are only a Pair of very large Finns, which ſerve as ſuch in the Water, and make it a very ſwift Swimmer. It is a good eating *Fiſh.*

Perca marina, Sectatrix. The *Rudder-Fiſh*, ſo called becauſe they are always ſeen following Ships, or ſticking to the Rudders.

Perca fluviatilis gibboſa, ventre luteo. The *Freſh-Water-Pearch.* By ſome called *Ground-Pearch*, from their burrowing into and covering themſelves in the Mud or Sand.

9. *Turdus pinnis branchialibus carens.* The *Mangrove Snapper.* It is eſteemed pretty good Food.

10. *Turdus rhomboïdalis.* The *Tang.* This *Fiſh* hath on each ſide the Tail a ſharp pointed Bone, which it can erect in its own Defence.

Turdus cauda convexa. The *Yellow-Fiſh.*

11. *Turdus flavus.* The *Hog-Fiſh.*

Turdus cinereus, peltatus. The *Shad.* This *Fiſh* hath an oval bony Subſtance upon his Noſe, like a [*Pelta*] ſmall Shield. It is eſteemed a good *Fiſh.*

12. *Turdus, oculo radiato.* The *Pudding-Wife.* Round the Eye ſpread ſeven blue Rays, at almoſt equal Diſtances, but of unequal Lengths.

Alburnus Americanus. The *Carolina-Whiting.* This is accounted tolerable good Meat.

13. *Mormyrus, ex cinereo nigricans.* The *Bone-Fiſh.*

Corallina fruticoſa elatior; ramis, quaquaverſum expanſis, teretibus. Sloane Hiſt. Jam. Vol. I. p. 57. The *Sea-Feather.* This *Plant*, and alſo the great *Sea-Fan* grow upright as moſt *Land-Plants* do; and do not grow horizontally as is uſually thought.

14. *Cugupuguacu, Braſil.* Sloane Hiſt. Jam. p. 247. The *Hind.* It is eſteemed a good *Fiſh* to eat.

Saltatrix. The *Skip-Jack.* It hath obtained its Name from its frequent Skipping out of the Water. It is tolerable good Meat.

15. *Suillus.* The great *Hog-Fiſh.*

16. *Aurata Bahamenſis.* The *Porgy.* It is a good eating *Fiſh.*

17. *Salpa purpuraſcens variegata.* The *Lane-Snapper.*

Petimbuabo, Braſil. Willough. p. 233. and App. 22. The *Tobacco-Pipe Fiſh.* It is long and ſlender like a Pipe, whence it hath receiv'd its *Engliſh* Name.

18. *Nova-*

18. *Novacula cærulea.* Will. p. 214. Tab. O. 2. The *Blue-Fiſh.*

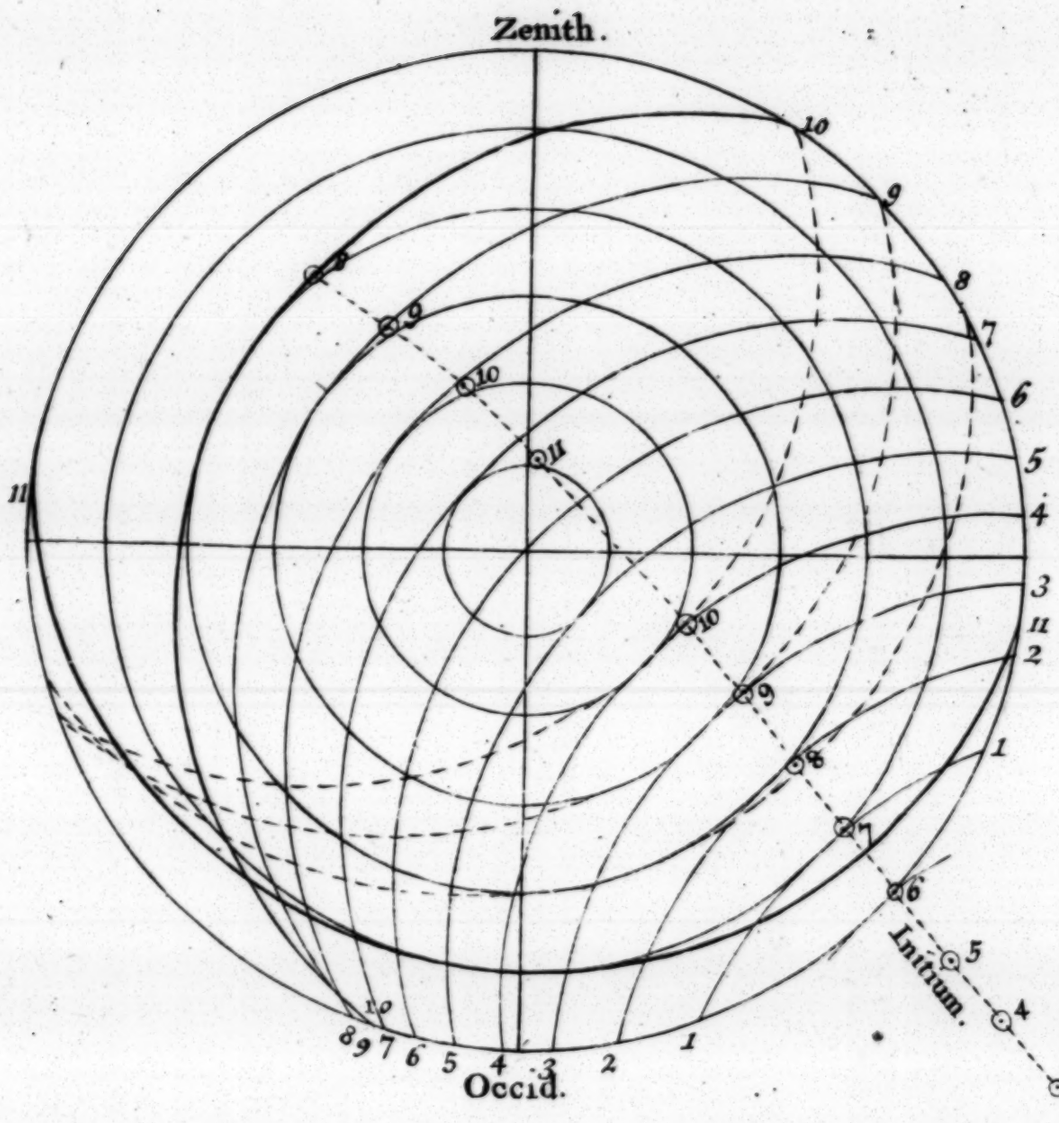
19. *Unicornis Piſcis, Bahamenſis.* The *Bahama Unicorn-Fiſh.* Theſe *Fiſh* grow only to two or three Feet in length, and a little behind the Eyes have an Horn about nine Inches long, which they can move at pleaſure. They are accounted poiſonous.

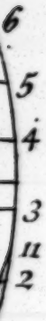
20. *Muræna maculata, nigra vel viridis.* The *Muray.* The Inhabitants of the *Bahama* Iſlands eat only the Green ſort, eſteeming the Black ones poiſonous to eat; yet the Bite of them is not venomous.

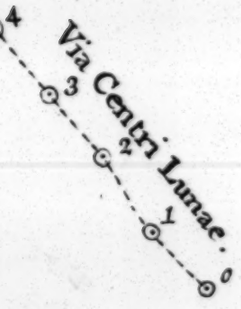
F I N I S.

Printed for W. INNYS and R. MANBY, Printers to the *Royal Society*, at the Weſt-End of St. *Paul's.*

M DCCXXXV.


Zenith.
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Numb. 433.

PHILOSPHICAL TRANSACTIONS

For the Months of *July*, and *Auguſt*, 1734.

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Jos: Banks

I. *Conjectures*

Printed for W. INNYS and R. MANBY, Printers to the *Royal Society*, at the Weſt-End of St. *Paul's*.

M DCCXXXV.

I. *Conjectures on the* Charming *or* Faſcinating Power *attributed to the* Rattle-Snake: *grounded on credible Accounts, Experiments and Obſervations. By Sir* Hans Sloane, *Bart. Preſident of the* Royal Society, *and* College *of* Phyſicians, *&c.*

THE various Relations not only of curious and credible Authors, who have given us Accounts of *Virginia*, *Carolina*, and the neighbouring Countries, but alſo the Teſtimonies of ſeveral Men of Integrity by word of Mouth, concerning what they call Charms, Inchantments or Faſcinations by Snakes, have often ſeemed to me greatly ſurprizing, without my being able to ſatisfy myſelf of the true Cauſe of ſuch Appearances.

Theſe Opinions are the greateſt Support of a common Notion, that ſeveral chronical waſting Diſeaſes, and ſuch Diſorders of the Nerves as are not eaſily accounted for, not only in Men, but in Cattle, are believed to be the Effects of an evil Eye of old malicious Women, *&c.* thought to be Witches and Sorcerers, or aſſiſted by the Devil.

In particular as to *Rattle-Snakes*, they all agree in their Relations, that thoſe Snakes keeping their Eyes fix'd on any ſmall Animal, as a Squirrel, Bird, or ſuch like, though ſitting upon the Branch of a Tree of a conſiderable Height, ſhall, by ſuch ſtedfaſt or earneſt Looking, make or cauſe it to fall dead into their

Mouths. This is a Thing ſo well atteſted, that they think there is no reaſon to queſtion their belief of it.

Mr. *Read*, an eminent Merchant in the City of *London*, had a *Rattle-Snake* ſent him alive in a Box with ſome Gravel from *Virginia*, which he did me the Favour to give me. It had lived three Months before without any Suſtenance, and had in that time parted with its outer Coat or *Exuviæ*, which was found amongſt the Gravel. Mr. *Ranby*, a very ingenious Surgeon and Anatomiſt, undertook the lodging it: And Captain *Hall*, a very underſtanding and obſervant Perſon, who had lived many Years in that Country in great Repute, ventured to take the Snake out of the Box; notwithſtanding that the Poiſon from the Bite thereof is almoſt preſent Death: For he gave us an Inſtance of a Perſon bitten, who was found dead at the Return of a Meſſenger going to the next Houſe to fetch a Remedy or Antidote, though he was not gone above half an Hour. Nay, ſo certain are the mortal Effects of this Poiſon, that ſometimes the waiting 'till an Iron can be heated, in order to burn the Wound, is ſaid to have proved fatal. This Gentleman told me he thought the ſecureſt Way was immediately to cut out the Part where the Wound was made; for he had ſeen ſeveral, who carried theſe hollow Scars about them, as Marks of the narrow Eſcape they had had, and never felt any Inconvenience afterwards.

Though Providence hath produced a Creature ſo terrible to other Animals, yet it ſeems to have provided it with the Rattle at its Tail, that the Noiſe thereof might give warning to them to get out of its way.

I de-

I desired an Experiment should be tried before several Physicians; which was accordingly done in the Garden belonging to their College in *London*. The Captain, by keeping the Head fast with a forked Stick, and making a Noose, which he put about the Tail of the Snake, tied it fast to the end of another Stick wherewith he took him out of the Box, and laid him upon the Grass-plat. Then a Dog being made to tread upon him, he bit the Dog, who thereupon howl'd very bitterly, and went away some few Yards distant from the Snake: But in about one Minute of time he grew paralytic in the hinder Legs, after the manner of Dogs who have the *Aorta descendens* tied. He died in less than three Minutes time, as is related by Mr. *Ranby*, in an Account of this Experiment in *Philos Trans.* N° 401. pag. 377. and by Captain *Hall*, N° 399. pag. 309.

In my Opinion the whole Mystery of their enchanting or charming any Creature is chiefly this: that when such Animals as are their proper Prey, namely small Quadrupeds or Birds, *&c.* are surprized by them, they bite them; and the Poison allows them time to run a small Way, as our Dog did, or perhaps a Bird to fly up into the next Tree, where the Snakes watch them with great earnestness, 'till they fall down, or are perfectly dead, when having lick'd them over with their Spawl or Spittle, they swallow them down, as the following Accounts relate.

" Some People in *England* (says Colonel *Bever-*
" *ley*, in his History of *Virginia*, Edit. 2d. p. 260,
" *Lond.* 1722. 8°. are startled at the very Name of the
" *Rattle-Snake*, and fancy every Corner of that Province

" ſo much peſtered with them, that a Man goes in
" conſtant danger of his Life, that walks abroad in
" the Woods. But this is as groſs a Miſtake, as
" moſt of the other ill Reports of this Country. For
" in the firſt Place, this Snake is very rarely ſeen; and
" when that happens, it never does the leaſt Miſ-
" chief, unleſs you offer to diſturb it, and thereby
" provoke it to bite in its own Defence. But it never
" fails to give you fair warning, by making a Noiſe
" with its Rattle, which may be heard at a conve-
" nient Diſtance. For my own part, I have travel-
" led the Country as much as any Man in it of my
" Age, by Night and by Day, above the Inhabi-
" tants, as well as among them: And yet before the
" firſt Impreſſion of this Book, I had never ſeen a
" *Rattle-Snake* alive, and at Liberty, in all my life.
" I had ſeen them indeed after they had been kill'd,
" or pent up in Boxes to be ſent to *England*. The
" bite of this Viper, without ſome immediate Ap-
" plication, is certainly Death: But Remedies are ſo
" well known, that none of their Servants are igno-
" rant of them. I never knew any kill'd by theſe
" or any other of their Snakes, although I had a
" general Knowledge all over the Country, and had
" been in every part of it. They have ſeveral other
" Snakes, which are ſeen more frequently, and have
" very little or no hurt in them: *viz.* ſuch as they
" call *Black-Snakes*, *Water-Snakes*, and *Corn-*
" *Snakes*. The black *Viper-Snake*, and the Cop-
" per-bellied *Snake*, are ſaid to be as venemous as the
" *Rattle-Snake*; but they are as ſeldom ſeen. Theſe
" three poiſonous Snakes bring forth their Young alive;
" whereas the other three ſorts lay Eggs, which are

" hatch'd

" hatch'd afterwards; and that is the Diſtinction they
" make, eſteeming only thoſe to be venemous, which
" are viviparous. They have likewiſe the *Horn-Snake*,
" ſo called from a ſharp Horn it carries in its Tail,
" with which it aſſaults any thing that offends it,
" with that Force, that, as it is ſaid, it will ſtrike
" its Tail into the But-end of a Musket, from whence
" it is not able to diſengage itſelf.

" All ſorts of Snakes will charm both Birds and
" Squirrels, and the *Indians* pretend to charm them.
" ſeveral Perſons have ſeen Squirrels run down a Tree
" directly into a Snake's Mouth. They have likewiſe
" ſeen Birds fluttering up and down, and chattering
" at theſe Snakes, 'till at laſt they have dropt down
" juſt before them

" In the end of *May*, 1715, ſtopping at an Or-
" chard, by the Road-ſide to get ſome Cherries,
" being three of us in Company, we were entertain'd
" with the whole Proceſs of a Charm between a *Rat-*
" *tle-Snake* and a Hare, the Hare being better than
" half grown. It happen'd thus: One of the Company
" in his ſearch for the beſt Cherries, eſpied the Hare
" ſitting, and although he went cloſe by her, ſhe did
" not move, 'till he (not ſuſpecting the Occaſion of
" her Gentleneſs) gave her a Laſh with his Whip.
" This made her run about ten Foot, and there ſit
" down again. The Gentleman not finding the Cher-
" ries ripe, immediately returned the ſame Way, and
" near the Place were he ſtruck the Hare, he ſpied
" a *Rattle-Snake*. Still not ſuſpecting the Charm,
" he goes back about twenty Yards to a Hedge to get
" a Stick to kill the Snake, and at his return found
" the Snake removed and coil'd in the ſame Place

" from

" from whence he had moved the Hare. This put
" him into immediate Thoughts of looking for the
" Hare again, and ſoon ſpied her about ten Foot off
" the Snake, in the ſame Place to which ſhe had
" ſtarted when he whipt her. She was now lying
" down, but would ſometimes raiſe herſelf on her
" Fore-feet, ſtruggling as it were for life or to get a-
" way, but could never raiſe her hinder parts from the
" Ground; and then would fall flat on her Side a-
" gain, panting vehemently. In this Condition the
" Hare and Snake were when he called me, and tho'
" we all three came up within fifteen Foot of the
" Snake to have a full View of the Whole, he took no
" notice at all of us, nor ſo much as gave a Glance
" towards us. There we ſtood at leaſt half an Hour,
" the Snake not altering a Jot, but the Hare often
" ſtruggling and falling on its Side again, 'till at
" laſt the Hare lay ſtill as dead for ſometime: Then
" the Snake moved out of his Coil, and ſlid gently
" and ſmoothly on towards the Hare, his Colours at
" that Inſtant being ten times more glorious and
" ſhining than at other times. As the Snake moved
" along, the Hare happen'd to fetch another Strug-
" gle, upon which the Snake made a Stop, lying at
" his Length, 'till the Hare had lain quiet again
" for a ſhort Space, and then he advanced again, 'till
" he came up to the hinder Parts of the Hare, which
" in all this Operation had been towards the Snake.
" There he made a Survey all over the Hare,
" raiſing part of his Body above it, then turn'd off,
" and went to the Head and Noſe of the Hare, af-
" ter that to the Ears, took the Ears in his Mouth
" one after the other, working each apart in his

" Mouth

" Mouth as a Man does a Wafer to moiſten it, then
" return'd to the Noſe again, and took the Face
" into his Mouth, ſtraining and gathering his Lips
" ſometimes by one ſide of his Mouth, ſometimes
" by the other. At the Shoulders he was a long Time
" puzzled, often halling and ſtretching the Hare out
" at Length, and ſtraining forward firſt one ſide
" of his Mouth, then the other, 'till at laſt he got
" the whole Body into his Throat. Then we went
" to him, and taking the Twiſt-band off from my
" Hat, I made a Nooſe, and put it about is Neck.
" This made him at length very furious; but we
" having ſecured him, put him into one end of a
" Wallet, and carried him on Horſeback five Miles
" to Mr. *John Baylor*'s Houſe, where we lodged
" that Night, with a Deſign to have ſent him to
" Dr. *Cock* at *Williamsburgh*, but Mr. *Baylor*
" was ſo careful of his Slaves that he would not let
" him be put into his Boat, for fear he ſhould get
" looſe and miſchief them. Therefore the next
" Morning we killed him, and took the Hare out of
" his Belly. The Head of the Hare began to be
" digeſted, and the Hair falling off, having lain a-
" bout eighteen Hours in the Snake's Belly.

" I thought this Account of ſuch a Curioſity
" would be acceptable, and the rather becauſe tho'
" I live in a Country where ſuch things are ſaid
" frequently to happen, yet I never could have any
" ſatisfactory Account of a Charm, though I have
" met with ſeveral Perſons who have pretended to
" have ſeen them. Some alſo pretend that thoſe ſort
" of Snakes influence Children, and even Men and
" Women, by their Charms. But this that I have

" related

" related of my own View, I aver (for the Satis-
" faction of the Learned) to be punctually true,
" without inlarging or wavering in any Reſpect, up-
" on the Faith of a Chriſtian.

" In my Youth I was a Bear-hunting in the
" Woods above the Inhabitants; and having ſtrag-
" gled from my Companions, I was entertained at
" my return with a Relation of a Pleaſant Rencounter
" between a Dog and a Rattle-Snake, about a Squirrel.
" The Snake had got the Head and Shoulders of the
" Squirrel into his Mouth, which being ſomething
" too large for his Throat, it took him up ſome-
" time to moiſten the Furr of the Squirrel with his
" Spawl, to make it ſlip down. The Dog took this
" Advantage, ſeized the hinder parts of the Squirrel,
" and tugg'd with all his might. The Snake on the
" other Side would not let go his hold for a long
" Time, 'till at laſt, fearing he might be bruiſed by
" the Dogs running away with him, he gave up his
" Prey to the Dog. The Dog eat the Squirrel, and
" felt no harm.

" Another Curioſity concerning this Viper, which
" I never met with in Print, I will alſo relate from
" my own Obſervation.

" Some time after my Obſervation of the Charm,
" my Waiting-Boy being ſent abroad on an Errand
" alſo, took upon himſelf to bring home a *Rattle-*
" *Snake* in an Nooſe. I cut off the Head of this
" Snake, leaving about an Inch of the Neck with it:
" This I laid upon the Head of a Tobacco Hogſhead,
" one *Stephen Lankford*, a Carpenter, now alive,
" being with me. Now you muſt note, that theſe
" Snakes have but two Teeth, by which they con-

" vey

" vey their Poiſon; and they are placed in the up-
" per Jaw, pretty forward in the Mouth, one on
" each ſide. Theſe Teeth are hollow and crooked
" like a Cock's Spur: They are alſo looſe or ſpring-
" ing in the Mouth, and not faſten'd in the Jaw-
" bone as all the other Teeth are. The Hollow has
" a Vent alſo through by a ſmall Hole a little be-
" low the Point of the Tooth. Theſe two Teeth
" are kept lying down along the Jaw, or ſhut like a
" Spring-knife, and don't ſhrink up as the Talons of
" a Cat or Panther: They have alſo over them a
" looſe thin Film or Skin of a Fleſh-colour, which
" riſes over them when they are raiſed; which I
" take to be only at the Will of the Snake to do In-
" jury. This Skin does not break by the Riſing of
" the Tooth only, but keeps whole 'till the Bite is
" given, and then is pierced by the Tooth, by
" which the Poiſon is let out. The Head being
" laid upon the Hogſhead, I took two little Twigs or
" Splinters of Sticks; and having turn'd the Head
" upon its Crown, open'd the Mouth, and lifted up
" the Fang or Springing-Tooth on one ſide ſeveral
" times; in doing of which I at laſt broke the Skin.
" The Head gave a ſudden Champ with its Mouth,
" breaking from my Sticks; in which I obſerved
" that the Poiſon ran down in a Lump like Oil,
" round the Root of the Tooth. Then I turned the
" other ſide of the Head, and reſolved to be more
" careful to keep the Mouth open on the like Oc-
" caſion, and obſerve more narrowly the Conſe-
" quence. For it is to be obſerved, that though the
" Heads of Snakes, Terrapins [*a ſort of Tortoiſe*]
" and ſuch like Vermin be cut off, yet the Body

" will not die in a long Time after, the general Say-
" ing is, 'till the Sun Sets. After opening the Mouth
" on the other Side, and lifting up that Fang alſo ſe-
" veral times, he endeavoured to give another Bite
" or Champ. But I kept his Mouth open, and the
" Tooth pierced the Film, and emitted a Stream like
" one full of Blood, in Blood-letting, and caſt ſome
" Drops upon the Sleeve of the Carpenter's Shirt,
" who had no Waſtecoat on. I adviſed him to pull
" off his Shirt, but he would not, and received no
" harm; and though nothing could then be ſeen of
" it upon the Shirt, yet in waſhing there appear'd
" five green Specks, which every waſhing appear'd
" plainer and plainer, and laſted ſo long as the Shirt
" did, which the Carpenter told me was about three
" Years after. The Head we threw afterwards down
" upon the Ground, and a Sow came and eat it be-
" fore our Faces, and received no harm. Now I be-
" lieve, had this Poiſon lighted upon any place
" of the Carpenter's Skin, that was ſcratched or hurt,
" it might have poiſoned him. I take the Poiſon to
" reſt in a ſmall Bag or Receptacle in the Hollow
" at the Root of theſe Teeth, but I never had the
" Opportunity afterwards to make a farther Diſco-
" very of that.

" I will likewiſe give you a Story of the violent
" Effects of this ſort of Poiſon, becauſe I depend on
" the Truth of it, having it from an Acquaintance
" of mine of good Credit, one Colonel *James Tay-*
" *lor* of *Metapony*, ſtill alive. He being with others
" in the Woods a Surveying, juſt as they were ſtand-
" ing to light their Pipes, they found a *Rattle-Snake*,
" and cut off his Head, and about three Inches of the
" Body.

" Body. Then with a green Stick, which he had in " his Hand, about a Foot an half long, the Bark be- " ing newly peel'd off, urged and provoked the Head, " 'till it bit the Stick in fury ſeveral times. Upon this " the Colonel obſerved ſmall green Streaks to riſe up " along the Stick towards his Hand. He threw the " Stick upon the Ground, and in a quarter of an " Hour, the Stick of its own accord ſplit into ſeve- " ral Pieces, and fell aſunder from end to end. This " Account I had from him again at the Writing " hereof." [*Beverley*'s Hiſtory of *Virginia*, from *pag.* 260, to 267.]

Father *Labat* likewiſe tells us (in his *Nouveau Voyage aux Iſles de l' Amerique*, Tom. IV. pag. 96, and 106. Ed. Paris, 1722. in 8°.) that Serpents, when they bite their Prey, retire, to avoid being hurt by them; and when dead, cover them with their Spittle, extend their Feet along their Sides and Tails, if Quadrupeds, and then ſwallow them.

II. *Part of a Letter from Dr.* Richardſon, *F. R. S. to Sir* Hans Sloane, *Bart. Preſident of the* Royal Society, *and* Colleg. Phyſic. *concerning the* Squilla aquæ dulcis.

I Have met with very little of late in Natural Hiſtory worth mentioning to you. One Thing I cannot omit, which I do not remember is taken notice of by any Naturaliſt; that is, the great Deſtruction that is made amongſt the ſmall Fry of Fiſh by the *Squilla aquæ dulcis*, which abound in moſt

 ſtanding

ſtanding Waters. In a ſmall breeding Pond nigh my Houſe, where I had formerly plenty of ſmall Carp and Tench every Year, and of late ſcarce any young Breed to be met with, my Gardener not long ago obſerved one of the *Squillæ*, with a Carp in its Mouth almoſt as large as itſelf; and has ſince obſerved theſe Inſects hunting amongſt the Weeds, and vigorouſly purſuing the ſmall Fry. I order'd the Gardener to catch ſome of theſe Inſects, and bring them home alive, with ſome of the ſmalleſt Fiſh he could meet with. We put them together in a large Baſon of Water. The Inſects were ſo rapacious, that they fell upon the Fiſh immediately, and deſtroy'd ſeveral in my Sight; and before Morning had devoured all that were in the Baſon.

North-Bierley,
Sept. 5, 1733.

RICHARD RICHARDSON.

III. *Schema* Eclipſeos Solaris *paulo ante ſolis occaſum obſervatæ*, *Vitembergæ Saxonum* Die II^do Maii *Stil. veter. A. Chr.* CIↃ IↃ CC XXXIII. *A* Joh. Frider. Weidlero *LL. D. Mathem. Superior. Prof. Ordin. R. S. S.*

Phaſes creſcentis Eclipſeos.

	H.	M.	S.	
Initium, 2 *Maii.* St. V.	6	36	5	Poſt Mer.
1 Digitus		39	50	
2 Digiti		45	5	

Digit.

Digit.	H.	M.	S.	
3	6	48	50	Poſt Mer.
4		52	50	
5		58	5	
6	7	2.	50	
7		7	50	
8		10	50	
9		15	50	
10		19	50	
11		29	20	

Sol ſubit nubes tenues

Phaſes decreſcentis Eclipſeos.

10 Digit.	7	35	50
9		40	50
8		44	50
Sol occidit		46	5

ANNOTATA.

1. Circulus in Tabulâ annexâ delineatus refert imaginem ſolis, ea magnitudine, qua in helioſcopii fundo fuit depicta.

2. Lumen ſolis, prope lunæ orbem, quod nunquam non in aliis Eclipſibus ſolaribus tam prope horizontem, quam ſub majore altitudine viſis vehementi motu & undulatione gaudere animadverti, in hoc deliquio quietum prorſus & tranquillum fuit.

3. Orbis lunæ, in primis quoad partem occiduam, in phaſibus paulo ante Solis occaſum notatis, aſperitatem manifeſtam, omnibus hujus phænomeni ſpectatoribus, prodidit; erant tamen intervalla, quibus juga

ga montium lunarium diſtinguebantur, nec lata admodum nec profunda. Adhibita ſcala ſubtiliter diviſa, æſtimavi profunditatem unius vallis $\frac{1}{200}$ ſive partem ducenteſimam diametri lunæ.

4. Ultimæ phaſes decreſcentes per tenues nubes viſæ fuerunt, neque tamen ultra undecim diſci ſolis uncias nobis luna occultavit.

5. Centri ſolis occaſus pro horizonte Vitembergenſi calculo tum fuerat repertus, $7^{h.}$ $39^{m.}$ $49^{ſe.}$ adeoque refractione radiorum in nubibus horizontis propemodum ſex minutis fuit retardatus.

IV. *An Abſtract of the* Meteorological Diaries, *communicated to the* Royal Society; *with Remarks upon them. By* W. Derham, *D. D. Canon of* Windſor, *F. R. S.* [PART II. Vide *Tranſact.* N° 429.]

PART III. *Containing Meteorological Obſervations made at*

Berlin		
Sweden	Lunden	1726.
	Bettna	
	Upſale	
	Bygdea	
	Pithea	

AN Abſtract of *Meteorological Obſervations* made in the Year 1726, at *Berlin*, by the Society there, and communicated by *Joh. Theod. Jablonski*; and in *Sweden*, at *Lunden*, by *Conrad Quenſel*, Mathematick Profeſſor in the *Caroline* Academy;

Academy; and at *Bettna* in *Sudermanland*, by *Andr. Geringius*, Paſtor and Provoſt of the Place; and at *Upſale*, by *Eric Burman*, Aſtron. Profeſſor in the *Guſtavian* Academy; and at *Bygdea*, in *Weſtro-Bothnia*, by the late *Jacobus Burman*, Paſtor of the Place; and laſtly, at *Pithea*, in the ſame Province, by *Olave Burman*, and *Iſrael Steckſenius*, Students.

Theſe Obſervations have, with ſo great Judgment, Diligence and Care, been made, ſome twice, and ſome thrice every Day, that I wiſh they could be publiſhed as they are; but by reaſon they are too numerous and bulky to be capable of that, therefore I have contracted them as well as I could, to make them uſeful to the Society; and that not without a great deal of Trouble, by Reaſon of the Difficulty to give a tolerable brief Account of ſo great a Variety and Number of Obſervations, as are thoſe of the Winds, and their Strength, the Weather, the Barometer, Thermometer, *&c.* of ſo many Places, and ſo many times every Day in the Year.

The moſt uſeful of the *Barometrical* Obſervations I have repreſented in the following Table; which ſhews, at an eaſy View, the higheſt, loweſt, and mean Heights of the Quickſilver in every Month, at the ſeveral Places.

	JANUARY.				FEBUARY.			
	Berlin	Lun.	Bett.	Upſa.	Berlin	Lun.	Bett.	Upſa.
High.	29.3	30.0 1/2	30.51	30.18	29.6	29.8 3/4	30.40	30. 2
Mean	28 7 1/2	29.3 1/8	29.92	29.58	28.6 1/4	29 1 1/2	29.74	29.53
Low.	28.0 1/4	28.5 3/4	29.26	28.98	27.6 3/4	28.4 1/4	29. 8	28.86

MARCH.

MARCH.

	Berlin	Lun.	Bettna	Upſa.	Pithea
High.	29. 0 $\frac{3}{4}$	30.0 $\frac{1}{4}$	30.50	30.24	30.11
Mean	28. 5	29.4 $\frac{1}{2}$	29.79	29.28	29.35
Low.	27 10 $\frac{1}{2}$	28.8 $\frac{1}{2}$	29. 8	28.32	28.50

APRIL.

	Berlin	Lun.	Bettna	Upſale	Pithea
High.	28.10	29.9 $\frac{1}{2}$	30.48	30.17	29.98
Mean	28. 5	29.5 $\frac{7}{8}$	29.86 $\frac{1}{2}$	29.66	29.27 $\frac{1}{2}$
Low.	28. 0 $\frac{1}{2}$	29.2 $\frac{1}{4}$	29.25	29.15	28.57

MAY.

	Berlin	Lun.	Bettna	Upſa.	Pithea
High.	28.9 $\frac{1}{4}$	30.0 $\frac{1}{2}$	30.40	30.16	30.11
Mean	28.4 $\frac{1}{2}$	29.7 $\frac{1}{8}$	30.77 $\frac{1}{2}$	29.84	29.74 $\frac{1}{2}$
Low.	28.0 $\frac{1}{2}$	29.4 $\frac{1}{4}$	29.35	29.52	29.48

JUNE.

	Berlin	Lun.	Bettna	Upſale	Pithea
High.	28.7 $\frac{1}{2}$	29.9 $\frac{1}{2}$	30.20	30.00	29.98
Mean	27.9 $\frac{1}{2}$	29.4 $\frac{1}{2}$	29.67 $\frac{1}{2}$	29.62 $\frac{1}{2}$	29.56 $\frac{1}{2}$
Low.	27.0 $\frac{1}{2}$	28.9 $\frac{1}{2}$	29.15	29.25	29.15

JULY.

	Berlin	Lun	Bettna	Upſa.	Pithea
High.	28.5 $\frac{4}{5}$	29.6	30. 5	29.88	29.56
Mean	28.2 $\frac{3}{4}$	29.2 $\frac{3}{4}$	29.70	29.54	29.37 $\frac{1}{2}$
Low.	28.0 $\frac{1}{4}$	28.9 $\frac{1}{2}$	29.35	29.20	29.19

AUGUST.

	Berlin	Lun.	Bettna	Upſale	Pithea
High.	28. 8	29.8 $\frac{3}{4}$	30.30	29.98	29.86
Mean	28. 3 $\frac{1}{4}$	29.3 $\frac{5}{8}$	29.65 $\frac{1}{2}$	29.48	29.28 $\frac{1}{2}$
Low.	27.11 $\frac{4}{5}$	28.8 $\frac{1}{2}$	29. 1	28.98	28.71

SEPTEMBER.

	Berlin	Lun.	Bettna	Upſa.	Pithea
High.	28.6	29.7 $\frac{3}{4}$	30.28	30.00	29.80
Mean	28.1	29.1 $\frac{3}{4}$	29.57 ^{2}	29.29	29.20
Low.	27.8	28.5 $\frac{3}{4}$	28.87	28.58	28.60

OCTOBER.

	Berlin	Lun.	Bettna	Upſale	Pithea
High.	28.10	30.1 $\frac{1}{2}$	30.55	30.25	29.90
Mean	28. 3 $\frac{1}{2}$	29.1 $\frac{7}{8}$	29.57 $\frac{1}{2}$	29.28 $\frac{1}{2}$	29.05
Low.	27. 9	28.2 $\frac{1}{4}$	28.60	28.32	28.20

NOVEMBER.

	Berlin	Lun.	Bettna	Upſa.	Pithea
High.	29.1	30.1 $\frac{1}{2}$	30.80	30.51	30.19
Mean	28.7	29.5 $\frac{1}{2}$	30.00	29.73	29.24
Low.	28.1 $\frac{1}{4}$	28.9 $\frac{1}{2}$	29.20	28.90	28.29

DECEMBER.

	Berlin	Lun.	Bettna	Upſale	Pithea
High.	29.1 $\frac{2}{3}$	30.0 $\frac{1}{2}$	30.50	30. 7	29.80
Mean	28.4 $\frac{1}{4}$	29.5 $\frac{1}{2}$	29.65	28.83 $\frac{1}{2}$	29. 0 $\frac{1}{2}$
Low.	27.8 $\frac{1}{4}$	28.4 $\frac{1}{4}$	28.80	28.60	28.21

Although this Table may give a good View of the *Barometrical Ranges* at the ſeveral Places in every Month of the Year 1726, yet I think it neceſſary to acquaint the Society with the great Agreement between the Aſcents and Deſcents of the ☿, ſometimes at the very ſame Time, and generally near it. If the ☿ was remarkably high or low, it was ſo in all, or moſt of the Places: If ſtationary for three or four, or more Days, it was the ſame in all. Only the Alteration would begin, or end, ſomewhat ſooner, or later, perhaps, in one place than another; and when any Deviation was from this

this Rule, it was commonly moſt remarkable in the *Pithea* Obſervations.

The *Thermometrical* Obſervations I can give no Account of, by reaſon I underſtand not the Thermometers there made uſe of, not the Freezing, Temperate, or other Points. Only the *Upſale* Thermometer (which was made by Mr. *Hauksbee*) muſt ſerve for all: In which the Point of extream Heat is marked five Degrees above 0; and ſo is graduated downwards to 45 Degrees, which is the Point of *Temperate*; and 65 Degrees, which is the Point of *Freezing*. The *Mean* of all the Degrees of every Month, at *Upſale*, the illuſtrious *Burman* hath noted according to Dr. *Jurin*'s Directions, in *Philoſ. Tranſ.* N° 379; which is, by adding the whole Month's Degrees, and dividing by the Number of Days. Which *Means* I have inſerted, as well as my own; mine being the *Means* between the higheſt and loweſt Degrees, as well of the *Thermometer* as *Barometer*. And becauſe I forgot to inſert the *Barometrical Means* of the illuſtrious *Lnnden* and *Pithea* Obſervers (which are according to Dr. *Jurin*'s way) but took only thoſe between the higheſt and loweſt Stations, therefore I have given this little Table of them.

A TABLE *of the Mean Barometrical Stations, by Dr.* Jurin's *way.*

JANUARY.		FEBUARY.		MARCH.	
Upſale	Pithea	Upſale	Pithea	Upſale	Pithea
$29.76\frac{10}{31}$		$29.47\frac{11}{14}$		$29.51\frac{3}{31}$	$29.28\frac{1}{18}$

April.		May.		June.	
Upſale	Pithea	Upſale	Pithea	Upſale	Pithea
29.76 $\frac{2}{5}$	29.49 $\frac{7}{15}$	29.91 $\frac{15}{31}$	29.82 $\frac{22}{31}$	29.59 $\frac{11}{15}$	29.49 $\frac{1}{5}$
July.		**August.**		**September.**	
29.53 $\frac{11}{31}$	29.38 $\frac{3}{19}$	29.54 $\frac{17}{31}$	29.27 $\frac{10}{31}$	29.34 $\frac{9}{10}$	29.14 $\frac{1}{6}$
October.		**Novembr.**		**December.**	
29.43 $\frac{13}{31}$	29.11 $\frac{17}{30}$	29.81 $\frac{1}{10}$	29.49 $\frac{23}{30}$	29.66 $\frac{23}{31}$	29.19 $\frac{2}{31}$

A Thermometrical *Table of the Higheſt, Loweſt and Mean Stations at* Lunden *and* Upſale, *with the* Upſale *Means, according to Dr.* Jurin's *Method.*

January.			1 February.			1 March. 1		
	Lun.	Upſa.	Upſa.	Lun.	Upſale	Lun.	Upſale	
High.	79	96.		85	83.7	111	82.0	
Mean	58 $\frac{1}{8}$	74.8	81.2 $\frac{14}{31}$	65 $\frac{1}{2}$	74.3 $\frac{1}{2}$	74.1 $\frac{21}{28}$	84 $\frac{1}{2}$	67.5	69.1 $\frac{13}{31}$
Low.	38	67.7		56	65	58	52.4	
1 **April.**			1 **May.** 1			1 **June.** 1		
High.	149	60. 9		187	47. 8	188	46. 7	
Mean	116	56.56	53.7 $\frac{17}{31}$	156	32.54	33.0 $\frac{2}{31}$	158 $\frac{1}{2}$	30.55	34.0 $\frac{7}{10}$
Low.	83	43. 3		125	18. 1	129	15. 4	
1 **July.**			1 **August.**			1 **September.**		
High.	173	42. 4		156	52. 2	168	62.7	
Mean	146	32.54	33.7 $\frac{15}{30}$	134 $\frac{1}{2}$	41.60	43.5 $\frac{13}{31}$	133	50.4	43.5 $\frac{13}{31}$
Low.	119	23. 4		113	32. 8	98	38.1	
1 **October.**			1 **November.**			1 **December.**		
High.	122	70.7		90	84.3	83	94. 8	
Mean	102 $\frac{1}{2}$	61.7	61.8 $\frac{22}{31}$	71	73.0	72.1 $\frac{1}{28}$	61	80.57	79.8 $\frac{5}{31}$
Low.	83	52.7		52	62.3	40	67. 7	

By

By this Table, eſpecially by the *Upſale* Obſervations, it appears, that the colder Months in this Year 1726, were not ſo exceſſively cold, as their Northerly Situation would incline one to imagine, *Upſale* itſelf being 60 Degrees North. But by the Table, ſome of the Days in *January*, *February* and *March*, &c. at the beginning of the Year; and of *September*, *October*, *November* and *December*, at the latter end of it, may be obſerved to have had the Thermometer ſometimes not ſo low, or very little below the *Freezing Point*. In *January* and *December*, for Inſtance, when it was at 67.7, which was lower than in the other Months, it was not 3 Degrees lower than the *Freezing Point*, at 65 Degrees.

But by the beſt Judgment I could make of the *Berlin* Thermometrical Obſervations, they ſeem to have had no leſs, if not more ſevere Weather, than in the Northern Parts, particularly than at *Lunden*, *Upſale* and *Pithea*, where the Weather ſeems to have been milder than at *Betna* and *Bygdea*; at which two Places, I find they had frequently Showers and Storms of Snow, and more hard Weather than at the other *Swediſh* Places, or *Berlin*.

What the Cauſe of this different Warmth ſhould be, I leave others to judge, whether the Proximity of the Sea, or the Warmth of mineral Vapours, and the Guard of their Woods ſkreening off the cold Winds (which two latter I remember *Ol. Magnus* aſcribes much unto.)

But for the better judging of the State of every Month, be pleaſed to take this View, which the curious Author of the *Betna* Obſervations hath given, together

gether with ſome Remarks of my own, from the other Places.

In *January* he ſays, the Winter Cold (which was very intenſe from the 23d of *December* to the 15th of *January*) began to abate, to the Diſadvantage of the Ways and Travelling.

In *February* he ſays the Winter Weather continued all the Month, to the middle of *March*, with ſome Snow, and Froſt enough to benefit the Ways and Travelling.

March he ſays began with Snow, and ſtormy and grievous Cold; but towards the latter end, the Weather was milder, and more ſeaſonable to the Agriculture newly begun. On the 14th, and 17th, was an *Aurora Borealis*.

In this Month, on the 17th and 22d, at *Berlin* alſo there were Signs of *Auroræ Boreales*, as alſo on *February* 23d.

Alſo at *Upſale*, a *Lumen boreale* was on *February* 27th, *March* 3d, 15th, and 16th.

In *April*, *Betna* is ſaid to have had a ſeaſonable Seed-time; and that the autumnal Corn, which had eſcaped the *Worm* (a Calamity I find common in thoſe Parts as well as *England*) began now to flouriſh.

At *Lunden* they had *Parhelii* on the 28th and 29th. At *Upminſter* we had the *Aurora Borealis*, or *Streaming*, in the Evening, *April* 12th.

In *May*, the reverend and learned Obſerver at *Betna* takes Notice, that by the continual and pernicious Heat of the Sun in this Month, the Corn was ſo burnt up, as to be a ſad Preſage of an enſuing Scarcity, and Dearth of Proviſions.

And

And at *Upſale* alſo, and *Berlin*, they mention great Drought, and exceſſive Heat of the Sun. But in ſome Parts of the Month, the Air at *Berlin* is ſaid to have been coldiſh.

In *June* the violent Heats were abated, and the Seaſon more moiſt and rainy. The Corn being too ſoon ripe, cauſed their Harveſt to fall out at a very unuſual Seaſon.

At *Lunden* and *Berlin* it was cold ſeveral Days and irkſome.

July I find was a rainy Month at *Berlin*, and moſt of the *Swediſh* Places (*Pithea* the leaſt.) At *Betna* it was very unwelcome to the Harveſt-men. Much Thunder alſo and Lightening was in moſt of the Places, chiefly at *Upſale*.

In *Auguſt* I find a greater Agreement between the Winds than in the other Months, they, in moſt of the Places, blowing from ſome of the Points between the Weſt and South. At *Berlin* and *Upſale* was much Rain, at *Pithea* Thunder; and at *Betna* the beginning of the Month, being mild and fair, is ſaid to be a good Seed-time; but it is remarked, that for want of Rain the Seed came not up well.

September was a very rainy Month in all the *Swediſh* Places, very Cloudy, and ſome Miſty, and Snowy at *Pithea*; but at *Berlin* better Weather. At *Lunden*, a *Parhelius* on *September* 11th.

In *October* the *Swediſh* Places had many *Auroræ Boreales*. At *Lunden*, on *October* 8th, 12th, and 24th. At *Betna* on the 8th, 10th, 12th, 13th, 15th, 22d, 26th. At *Upſale*, on the 3d, 6th, and eſpecially the 8th. And the ſame Evening of *October* 8th, at *Upminſter*, we had a very remarkable whitiſh

whitiſh Liſt, or Girdle went croſs the Heavens, from Weſt by South, to Eaſt by North, about half a Degree broad; which continued but a little while, and then the whole Hemiſphere was covered with ſtreaming Vapours, in all Parts emitting Lances that pointed towards the Zenith, where they formed a Canopy; ſometimes reddiſh, ſometimes darker, and ſometimes blazing, as if ſet on Fire, and emitting Lances every way, ſo as to make an Appearance of the Star which the Knights of the Garter wear. This Canopy moved ſometimes ſome Degrees Eaſtward, and then would return back again near the Zenith. When the Vapours and Lances ſhone out moſt, I obſerved a ſtrange Commotion and Working in them, as if ſome large Body was behind them, and diſturbed them. This *Aurora Borealis* being different from thoſe that uſually appear, I was minded to take this Occaſion of mentioning it with others that were ſeen at the ſame Time in *Sweden*.

The Weather in this Month was Rain, and hoar Froſts in the *Swediſh* Places, with much Snow at *Bygdea* and *Pithea*; a *Parhelius* at *Lunden*, *October* 14th: And the illuſtrious *Betna* Obſerver ſaith, the Plenty of Rain this Month cauſed the Corn to thrive much; and he reckons the 31ſt Day of this Month to be then the firſt Winter Day with them, it being Froſty, and abundance of Snow that Day. At *Berlin* it ſeems to have been a dark and cloudy Month, with irkſome Cold towards the latter end.

In *November Auroræ Boreales* were at *Lunden* on the 2d, 7th, and 8th; at *Betna* the 2d. At *Lunden*, and *Upſale*, it was Cloudy, Foggy, Froſt and Snow: At *Bygdea*, *Pithea* and *Berlin*, fairer, with

with Froſt and ſevere Cold. At *Betna* the Cold was very intenſe; the Heavens very cloudy and miſty.

In *December*, at *Lunden Auroræ Boreales* were on the 5th, 6th, 7th, 8th, 9th, 10th, 14th, 15th, 16th, and 22d Days; and at *Upſale* on the 5th and 6th; and at *Berlin*, on the 7th and 12th there were Signals of the *Auroræ Boreales*. Froſt, and Snow, Cloudy and Fogs were at *Lunden*; at *Upſale* ſome Cloudy and Foggy, and a pretty deal of Fair ſometimes: At *Berlin* much Froſt, Cold, and a great Storm of Wind on the 23d: At *Pithea* frequent Snow, and ſome Fair, ſome Cloudy. *Betna* is noted to have moderately Snow, but twice more intenſe Cold, to the great Benefit of the Ways and Travelling.

For the better underſtanding the foregoing Obſervations, and for a Concluſion of them, it is to be obſerved, that the *Lunden Barometrical* Obſervations were made with a *Barometer* graduated according to our *Engliſh* Meaſure, into Inches, and I ſuppoſe Decimals of Inches. But the Thermometer (as I ſaid) I underſtand not.

The *Betna* Barometer alſo is graduated, according to *Engliſh* Meaſure, into Inches and Centeſms.

The *Upſale* Barometer and Thermometer, were both made by Mr. *Haukesbee*, and conſequently are according to *Engliſh* Meaſure; the Barometer having Inches and Centeſimal Parts; the Thermometer as I have before deſcribed.

The *Bygdea* Obſervations the Reverend Author did not live all the Year to finiſh, and there being none Barometrical, or Thermometrical, only a verbal Account of the Weather, and now and then of the Winds; therefore I have only, as Occaſion ſerved, taken notice of thoſe Remarks. The

The *Pithea* Obſervations had none Thermometrical; and thoſe of the Barometer ſeem to be in Inches and centeſimal Parts.

V. De AMBRA GRYSEA. *Auctore* Caſparo Neumanno, M. D. *Chemiæ Profeſſ. Berolin. & R. S. S.*

PARS I.

DUO in Re Medica jure meritoque perquam mirari mihi ſæpè ſubiit 1.) quod certæ ſpecies, quæ ut ſubjecta pharmaceutica per longum tempus, imo quædam per aliquot ſecula in uſum vocatæ fuerunt, ita ut de aliquibus etiam in ſola Europa, non duæ vel decem libræ, ſed Centenarii aliquot quotannis conſumantur, ratione hiſtoriæ naturalis, loci natalis, originis, ubi & quomodo generentur, atque ex quo ortum ſuum trahant, præcipuè de variis uſualibus Vegetabilibus exoticis, e. gr. de Myrrha, quæ ab aliquot Millenariis jam adhiberi conſueverit, ut & de ſic dicto Gummi Animæ, Carannæ, Sanguine Draconis, Semine Cinæ, ac permultis aliis ſpeciebus, quales etiam variæ in reliquis Regnis occurrunt, ad hunc uſque diem non ſatis certò, genuinè, demonſtrative, & indubitatò cognitæ ſint; ſed de quibuſdam nihil niſi diſputabilia, dubioſa, variata, ſibi invicem contradicentia, plerumque tantum ex auditu oborta, quædam ab aliis ficta, & ex cerebello proprio ſibi comparata, indeque ut plurimum apertè falſa, ac de quibuſdam planè

planè nulla, de multis vero non ſufficientia documenta præſto ſint: 2.) quod pauciſſima Subjecta naturalia pharmaceutica, materiam medicam conſtituentia, & à tot retrò Seculis uſurpata, quæque quotidiè adhuc uſurpantur, *ratione veræ ſuæ mixtionis & partium ſubſtantialium*, quid propriè & reverà natura ſua ſint, aut quas demonſtrabiles, ſeparabileſque, non tantum viſibiles, ſed præcipuè olfactu ac guſtu perceptibiles, & re ipſa activas partes contineant? aut in qua ſeparabili ſubſtantia & parte compoſiti naturalis (licet à vulgo Simplex appelletur) eminenter characteriſticum, ſpecifico olfactu, guſtu & viribus ſe prodens eſſentiale reſideat, vel à natura poſitum ſit? adhucdum ignorentur, ſed uſque quaque ab hac vel illa fama, dictu, auditu, ſcriptu, & notificatu horum & illorum in aliis mundi regionibus habitantium vel peregrinantium hominum, vel etiam tantum in Europa viventium Mercatorum, lucri cupidorum Materialiſtarum, item Politicorum, qui Rem Medicam ac fundamentalem hiſtoriam naturalem plerumque ignorant, Jeſuitarum, Monachorum, Militum, Nautarum, Piſcatorum, Metallicorum, Hortulanorum, imo etiam quorundam in veræ chymicæ & demonſtrativæ Phyſicæ experientia non ſatis fundatorum Medicorum, plurima pars tanquam certa veritas ſimpliciter credita, ex uno libro in alium tranſcripta fuerit, adhuc tranſcribatur, ac credatur; de quo tamen ſub impartiali & non præoccupato fundamentali examine nihil minus, quam id, quod hactenus dictum, ſcriptum, & per tot annos ad hunc uſque diem creditum fuit, ut revera verum, ſed longè aliud, hucuſque non dictum, non ſcriptum, nec creditum deprehenditur. Quanta inſcitia, ac quam multi errores circa haſce

duas circumſtantias in ſtatu Medico præſto ſint, hoc vix ac ne vix quidem ſibi aliquis imaginaretur, quanquam & ego, pro mea tenuitate, diverſa hujus rei ſpecimina ob oculos ponere poſſem, dum aliquot ab annis, ex quo miſerabilem hunc ſtatum aliquatenus perſpexi, animo meo propoſui, ſimulque non exiguam impendi operam, primò maximè duntaxat uſuales, & pro notiſſimis habitas ſpecies, quantum fieri potuit, cum cura ad manus ſumendi, examinandi, ac perveſtigandi, indeque factum eſt, ut varias veritates erue im, multaſque fallàs traditiones & imaginationes, chimæricaſque opiniones detexerim.

Negare equidem non poſſum, mihi, ratione hiſtoriæ naturalis, tanquam primæ ſupra memoratæ circumſtantiæ, in rebus permultis abſolutam impoſſibilitatem obſtitiſſe, *a*) partim, quia in loco natali precipuè Animalium & Vegetabilium exoticorum ipſe non adfui, *b*) partim, quoniam merè æquivocæ, incertæ, & cum eorum elaboratione planè non conſentientes relationes in libris de ipſis reperiuntur, *c*) partim vero quoque, quia in permultis, inprimis ſpeciebus pleriſque mineralibus, nemo earum generationi & modo fiendi non tantum non adeſſe, vel ipſarum geneſin adeo viſibiliter, uti fortaſſis longè magis Vegetabilia, & Animalia, obſervare, ſed etiam nequidem ſatis rationaliter ea ſibi præfigurare ac dijudicare poteſt ; quanquam circa totam hanc circumſtantiam facilè quoque excuſari queam, dum huic rei, quoniam tot obſtacula & impoſſibilitates coram me reperi, non ita induſtriè memet applicui, nec hiſtoriam naturalem tanquam primarium meum ἔργον conſideravi ; E contra vero, cum providentia divina, naturalis inclinatio, tempus & occaſio, jam à multis annis,

annis, me in propriam, ad veram corporum naturalium inquisitionem pertinentem officinam, ad Scientiam & Praxin chymicam puto, deduxerit, tanto magis ad secundam antedictam circumstantiam, nempe investigationem mixtionis substantiarum naturalium, animum seriò applicavi, quo ejusmodi ante oculum positas materias officinales, afferantur etiam nobis quoquò velint, sive ex India Orientali, vel Occidentali, sive ex Europa vel Africa, sive sint Vegetabilia, Animalia, vel Mineralia, sive appellentur communiter prout velint, antea quam medicamenta, vel alia communi usui inservientia præparata exindè conficiantur, ad minimum ipse, quoad naturalem earum mixtionem, ex fundamento cognoscere addiscerem, in qua investigatione utique non nudum visum solum & externum aspectum (ut alias fieri solet) sed præcipuè circumspectam chymicam Anatomiam adhibui, idque tantò magis, cum vias per Microscopia, externas geometricas præfigurationes, pneumaticas hydrostaticas aliasque usuales dijudicationes non modo planè non sufficientes, sed sæpe etiam seducentes & fraudulentas, quinimo, si dicere liceat, ad inquisitiones physico-chymicas parum utiles aut demonstrativas, sed tantum nudè verbosas, & ad alias potius scientias, quam ad Chymiam idoneas deprehenderim, prout hac de re jam alio tempore mentem meam explicavi.

Non autem lubet adducere, quid in tot hic publicè tractatis ac evolutis Subjectis trium Naturæ Regnorum, singularis & adhucdum incogniti, in libris saltem, qui de his materiis hactenus prodierunt, non inventi, detexerim; sed hoc loco tantum de unica materia sententiam meam, & quomodo eam sub ana-

lyſi chymica invenerim, exponam ; huncque laborem tanquam alterum leve ſacrificium Celeberrimæ & Illuſtri Regiæ Magnæ Britanniæ Scientiarum Societati offeram, præcipuè verò hiſce tantum indicabo, quod flagrem cupiditate, ad primariam Illuſtris hujus Societatis intentionem, utpote quæ præ aliis indies magis magiſque ulteriorem natura inveſtigationem molitur, & mea, pro modulo meo, conferendi atque contribuendi.

Hæc autem mea Materia jam eſt AMBRA GRYSEA ſubſtantia pharmaceutica officinalis, de qua à multis retro annis diu multumque diſceptatum eſt, quid propriè ſit ? & de qua, ante 5, vel 6 annos, relationes quædam ex America apportatæ ſunt, quarum contenta firmam ſententiam, certitudinemque, quid revera ſit, detexiſſe ſibi præſumunt, quas vero relationes, quia illæ cum examine chymico, quod hac cum materia inſtitui, non concordant, pro deciſiva accipere nequeo; idque proinde me permovit haſce pagellas conſcribere, quo Scrutatores rerum naturalium, qui tam in America, quam etiam alibi vivunt, his tantò magis, ad ulteriorem hujus rei certitudinem inquirendam, incitarem.

Non detinebimur in inquiſitione etymologica vocis Ambra, an ex Arabico عنبار Ambaron, vel Græco ἄμβαρ oriatur, & quod protereà latinè rectius Ambarum & non Ambara, multo minus Ambra dici debeat : ejuſmodi enim inquiſitio nihil aliud eſſet, quam inneceſſarium, gallicè dictum, *Embarràs*; ſed ſufficit, quod vocabulum Ambra hodie in toto orbe uſu receptum ſit, & quivis ſciat, quid per hoc intelligatur ; nec Homonymiam adducam omnium eorum, quæ ab Ambra nomen acceperunt, dum nempe non tantum

tantum Ambra gryſea, ſed etiam Ambra citrina, Ambra nigra & Ambra liquida in uſu ſunt, quinimo in quibuſdam libris etiam Ambræ ſubalbidæ, item Ambræ tam nativæ quam factitiæ mentio fit, quanquam exinde colligere tantum liceat, quod vocabulum Ambra ſolum, hodiè nihil certi ac ſpecifici determinet, ſed quod neceſſe ſit, cum tot diverſæ ſpecies proſtent, ſemper vocabulum diſtinctivum, quo ea Ambra, de qua dicitur vel ſcribitur, tanquam charactere inſignitur, voci Ambræ addere. Interim hoc memoratu dignum eſt, quod Ulyſſes Aldrovandus in Muſeo ſuo Metallico * effert, quod ſcilicet ſub generali nomine Ambra, *totum genus Succini* intelligatur, nec minus, quod jam Mauritani † *Ambræ impoſuerint nomen Succini*; prout etiam hodiè Ambra à quibuſdam Succinum Orientale appellatur; Sic & à longo jam tempore Succinum ordinarium ſolitum eſt vocari Succinum occidentale, ad differentiam Succini Orientalis, & vice verſa hoc, Ambra gryſea, illud autem, Ambra citrina vel flava; quinimo notum eſt apud multas Europæas nationes, nomen Ambræ abſque additione uſurpatum, nullam aliam Ambram, quam commune Succinum indicare, quæ Obſervatio me ad minimum eò adducit, ut credam, quod ii ex majoribus noſtris, qui dùos hoſce titulos, dum nempe tam Succinum commune Ambra, quam vice verſa etiam Ambra gryſea Succinum appellatur, primum introduxerunt, jam tum temporis verum conceptum de Ambra gryſea, quid nimirum ſit, vel quæ partes mixtionem ejus conſtituant, habuerint.

* Libr. III. Cap. xxi. Pag. 430.
† Petr. Andr. Matthioli Opera Edit. Caſp. Bauhini. Pag. 66.

Hoc

Hoc tantum adhuc de Ambra gryſea, ratione nominis, addam, quod illa quoque Ambra Indica, Ambra Orientalis, Ambra Odorifera, & Ambra vera, communiter autem Ambra gryſea ſive chryſea appelletur; diverſas e contra barbaras ipſius Ambræ gryſeæ diſtinctiones, ut Porambar, Puambar, & Pinambar, item Ambra rufa, pinguis, Selachitica, Sechra, ejuſmodique alia, ſilentio involvam, quippe quæ ad propoſitum meum Scopum nihil utilitatis conferunt.

Non poſſum non mox in principio fateri, quod, ſi tot diverſas & ſemper differentes opiniones perpendo, quas de hoc ex mari prodeunte Subjecto Ambra noſtra gryſea olim foverunt, atque ex parte adhuc fovent, mihi videatur, ac ſi memet ipſum amplo mari vel planè ejus abyſſo concrediturus, ibique certam concluſionem ex tam multis incertis relationibus & præfigurationibus formaturus eſſem; nam proculdubio perpaucus erit earum rerum in mundo numerus, quibus tot differentes modi originis & nativitatis affincti ſunt, quam huic Subjecto, tantum enim abeſt, ut contenti fuerint, quod alius Regno Vegetabili, alius Regno Animali, & tertius Regno Minerali, idque rurſus variis mutatis modis, adeoque omnibus tribus conſuetis Naturæ Regnis illud attribuerit, ut potius alij planè Regno Aëreo id adſcripſerint, imo ſunt, qui his Regnis non contenti, adhuc plura fingunt, dicentes: Ambram gryſeam ad nullum ſupra dictorum Regnorum pertinere, ſed ad Regnum marinum; quanquam univerſum mare cum toto ipſius Suppellectili Animalium, Piſcium, Conchyliorum, Plantarum, Lapidum, Aquarum, Salium, & quicquid in ſe continet, commodè ad tria ordinaria Naturæ Regna, puto Regnum Minerale, Vegetabile & Animale, abſque

que ulla contradictione vel dubia prolixitate diſpeſci poteſt, adeoque & hæc ex Pelago prodeuntia ejuſmodi extenſionibus atque diſtinctionibus planè non egent.

Omnes hæ differentes, partim miræ, ſi non ridiculæ, opiniones in variis Scriptis conſignatæ reperiuntur, e. gr. in Cæſalpino, Monarde, Hernandez, Monconys, Eraſmo Franciſci, item, Chevalier, Wedelio, Pfeiffero, Metzgero, Oelven, & præcipuè in adeo operoſe collecta Hiſtoria Ambræ Juſti Fidi Klobij, ut & in multis aliis, quos hic adducere non modo nimis prolixum, ſed paucæ etiam aut nullius utilitatis, adeoque tædioſum potius foret; Interim, ut in fine tanto certiorem concluſionem formare poſſimus, neceſſarium nihilominus duco, eos paucis, & quaſi ſummatim hic attingere, ubi tamen in apertè abſurdis non diu morabimur, in magis probabilibus verò & à permultis Viris receptis creditiſque opinionibus, etiam aliquatenus meam (ſi non palàm in oculum, ſaltem in animum facilè incurrentem) antitheſin, tandemque proprium meum aſſenſum, cui opinioni adhæream, referam: ubi ſimul mihi propoſui, hunc opinionum numerum, quid Ambra ſit, & unde proveniat, ſecundum ſic dicta diverſa Naturæ Regna coordinare, adeoque cum Supremo excelſoque, Regno ſcilicet aëreo ordiri, & ab hoc ſenſim ſenſimque humiliora ad ſubterranea uſque petere ac me demittere.

Pro Regno Aëreo unus tantum (quantum ſciam) militavit, nomine Oelven, hic nempe Ambram *pro Meteoro* habuit, ſeu pro ejuſmodi re, quæ in aëre generetur, atque hanc, quamvis apertè falſam hypotheſin variis rationibus ſuffulcire anniſus eſt, quæ

vero

vero nihil niſi ventum & aërem ſpirant ;; Cumque hæc opinio vel à ſolo, interdum ad pondus centum librarum excurrente, pondere, à ſubſtantia & mixtione partium eſſentialium Ambræ gryſeæ ſufficienter labefactetur, hinc operæ pretium non erit, huic diutius immorari, ſed eam verè ſimpliciſſimam habeo, præſertim, cum ipſa quoque jam Anno 1707 apertè refutata fuerit.

Poſt hæc permulti Regnum intrant Animale, ita tamen, ut Regnum Aëreum certo reſpectu non planè derelinquunt, hi nempè quærunt ac ſtatuunt, Originem Ambræ gryſeæ à Volatilibus ſeu in Aëre volantibus creaturis provenire, quanquam hoc iterum cum notabili quadam differentia, quæ in duas eos diſpeſcit claſſes : *a)* Quarum prima, Ambram gryſeam eſſe *Fimum avium*, perhibet, ad quam opinionem exindè ſeducti ſunt, quia in Ambra ſæpius exigua avium roſtra, vel parvæ ungulæ, vel earum ſaltem particulæ reperiuntur ; Quinimo deſcribunt ipſam avem, à qua Ambra proveniat, quod nempè magnitudine anſerem æquet, pulcherrimas plumas atque maculas habeat, cujus nomen, linguâ Maldivicâ, Anacangriſpaſqui, & linguâ Madagaſcarica Aſchibobuck audiat. Ferdinandus Lopez de Caſtagneda, * ut & alij ſtatuunt, quod avis hæc varias fragrantes herbas comedat, exindeque oriens precioſum ſtercus ſuper rupes ac petras in & circa mare deponat, quod interdiu à ſole digeſtum atque maceratum, noctu vero à luna depuratum, adeoque ab utroque luminari cœleſti in Ambram gryſeam maturatum, præparatum & perfectum redditum, deinceps procelloſa tempeſtate à fluctibus maris ab-

* Rerum à Luſitanis in India Orientali geſtar. Scriptor, Lib. IV. Cap. xxxv.

lutum

lutum in mare natans deferatur, tandemque 1.) vel ita, ut à rupibus ablutum eſt, ad littus appellatur & ad oras projiciatur, 2.) vel etiam à Cetis deglutiatur, qui tamen illud, cum digerere non poſſint, utplurimum brevi rurſus evomant; (*b.*) Altera autem claſſis alatæ opinionis, cui præprimis Denis *, Monconys †, Lemery ‖, Et Pomet **, Si non plurimi ex Gallica natione adhærent, Ambram gryſeam provenire ait ab inſecto quodam, & quidem ab apibus, eſſe ſcilicet *Favum Apium*, conglobata apiaria, & cereas cellulas: utrique in deſcriptione nominati ferè iiſdem utuntur verbis, tribus tantum immutatis literis, ita ut quis pro vitio typographico ea habere poſſet, illi enim aiunt: eſt Fimus avium, hi vero: eſt Favus apium; Claſſis hæc in permultis imo plurimis circumſtantiis cum priori, nempe in puncto eluitionis à petris & rupibus, digeſtionis & coctionis ſolaris, &c. concordat, tantum quod hi apes, illi aves, hi excrementum cereum & melleum, illi ſtercoreum, utrique tamen Animalia alata ſpecificent; ubi poſteriores, pro confirmanda ſua hypotheſi, non quidem lunam, ſed modò ſolem in auxilium vocant; Formale Opinionis illorum eo tendit: degere ſcilicet certum quoddam apium genus in illis locis, in quibus Ambra gryſea ordinariò reperiri ſoleat: has apes exſtruere alvearia ſua ſuper rupes ad & circa

* Rec. des Memoires & Conferences ſur les Arts & les Sciences 1672. M. Aug. Pag. 222, & ſ. it. Mediſeri Coſmograph. Tom. I. p. 101. it. Ejus deſcriptio InſulæMadagaſcar Cap. vi. pag. 43. it. Odoardus Barboſa, it. Andr. Tevet & Franc. Belloforeſtus.

† Monconys in Itinerario ſuo Edit. Pariſ. en Suite de la II. Partie, p. 143. item Edit. Londinenſ. pag. 71.

‖ Traitè Univerſel des Drogues ſimples, pag. 34.

** Hiſtorie generale des Drogues, Part. II. Lib. I. pag. 57.

maris littora (alij ſubtilius id proponunt, dicentes: Apes alvearia ſua non ſupra ſed infra rupes, ſcilicet in cavernis rupium exſtruerè) unde procellæ maris illa eluant, eodem modo ut præcedentem Fimum avium, quæ poſteà à continua fluctuum agitatione, ab accedente aqua ſalſa, & cooperante ſole ita digerantur, attenuentur, torreantur & alterentur, ut tandem Ambra evadat, ſubque hac forma tum ad littus ejiciatur; hujus opinionis aſſeclæ eam adhuc ſtabilire nituntur per albam iſtam tenacem & viſcoſam ſubſtantiam, quæ plerumque ex Eſſentia Ambræ ſeſe præcipitare ſolet, quamque cereum quid eſſe perhibent.

Quod autem utraque opinio tam de Fimo Avium, quam Favo apium falſa ſit, patet ex ſequentibus circumſtantiis, quæ hiſce contradicunt: 1.) Sufficiens copia Ambræ gryſeæ reperitur iis in locis, in quibus nihil quicquam deſcriptarum avium & apium videre aut reperire licet, 2.) etiam ubi paucæ vel nullæ rupes aut petræ viſuntur, 3.) vel ubi ſaltem præſentes petræ & rupes antedicti ſtercoris avium, vel apiariorum expertes ſunt.

Quod autem in ſpecie opinio *de Fimo avium* falſa & erronea ſit, apparet porro ex ſequentibus: 1.) Eæ avium partes, quæ interdum in Ambra gryſea reperiuntur, non ſunt roſtra anſerina aut pedes, ſed leves tantum, atque perquam teneræ particulæ 2.) Neſcirem ego, qua ratione roſtra & ungulæ aliaque ſimilia cæterarum etiam avium, in corpus vel ſtercus antedictarum, anſeres magnitudine æquantium, avium, ut putant, ambriferacium, tranſire poſſent, 3.) Fragrantes herbæ comeſtæ nullatenus ſtercus fragrans reddunt, & hæc opinio tam abſurda mihi videtur,

detur, quam hiſtoria illa de pabulo porcino, ubi Dominus porcorum juſſit, horum pabulo Caryophyllos aromaticos & piper immiſceri & porrigi, quia hac ratione non opus foret, ea aromata farciminibus addere, ſi porci mactarentur, farciminaque exinde conficerentur 4.) Contrariatur experientiæ univerſali, quod Sol digeſtione ſua ejuſmodi excrementis odorem conciliet fragrantem, è contrario movet potius ac promovet putrefactionem, mediante qua non odor fragrans Ambratus, ſed ſemper nauſeoſus ingratus foetor producitur, præcipuè cum multa mollioraque excrementa conjuncta ſint, prout ſæpè grandes & viſcoſæ adhuc Ambræ maſſæ repertæ fuerunt; vel Sol etiam extrahit ac emovet fragrantes particulas, ſi ipſi minora & ſicciora excrementa, uti multarum avium fimi ſunt, occurrunt, quæ ſæpius irradiat, ita ut ea tandem planè exſiccata, macræ terræ adinſtar, apparere ſoleant 5.) hic avium fimus in mari à fluctibus, ſi non maxima ex parte ſolveretur, in minutias ſaltem divideretur & divelleretur, ut ut etiam radii ſolis ac lunæ quam diligentiſſime eum irradiaverint, quanquam 6.) Fluctus vix ſemper ad illud uſque tempus expectaturi ſint, donec fimus à ſole & luna prius ſatis coctus ac digeſtus fuerit, ſed certò tam recentia excrementa ſeu fimum avium, quam putatitiè digeſtum, abluere poſſent, qui recens tanto magis in aqua ſe diſſolvi atque diſpergi pateretur, unde autem tum adeo notabiliter magna, interdum quadrans, dimidium, imo totum Centenarii pondus æquantia, adhæc uniformia & ſatis ſolida Ambræ fruſta oriri poſſent? Qua ratione tanta fruſtorum magnitudo & Ambra ipſa cum fimo, qui in aqua tam facilè ſe ſolvi vel ſaltem extrahi

 patitur,

patitur, convenire valet? 7.) Incolæ, Piſcatores & Nautæ, capturæ Ambræ operam dantes, neſciunt ejuſmodi aves & excrementa, 8.) Si hæc concluſio ſequeretur: Quia avium officula, roſtella & ungulæ in Ambra gryſea reperiuntur, ergo Ambra gryſea quoque eſt fimus avium, tum hic interrogo primò: Quis unquam audivit, aves tota roſtra, pedes & ungulas, vel ejuſmodi noſcibiles avium partes per alvum ejicere? deindè appono, ſi prior concluſio ſequeretur, affirmare etiam poſſem, quod Ambra ſit fimus Concharum, Sepiæ ac aliarum, dum itidem tam variæ Conchyliorum quam avium partes in Ambra reperiuntur, 9.) contradicit huic opinioni Subſtantia & naturalis mixtio, imo denique chymica analyſis Ambræ gryſeæ, dum nullibi veſtigium excrementi inveniri poteſt; ut alias contradicentes circumſtantias jam prætream.

Et ſic etiam in anteceſſum opinio *de Favo Apium* ex variis ante adductis refutari poteſt, quod falſa ſit: 1mo) enim ejuſmodi Apes & Alvearia itidem, ut antea ſub N° 7. de fimo avium adduxi, à pluribus hominibus in iſta regione obſervata ac viſa fuiſſent de quibus tamen nemo, nec in Aſia, nec in America, quicquam notavit, adeoque ſolus is eſt noſter Denis atque Monconys, quique gratuitum his aſſenſum præbent, 2do) & poſito, ſi aliquot centena millia Apiariorum ſeu alvearium ſupra & infra rupes vel alio quoque modo juxta mare eſſent, cum tamen pluvia ac procelloſum mare apibus perquam infeſta & noxia ſint; poſito quoque, quod totum mellificium, ſeu maſſæ illæ in mare provolvantur; quis vero crediderit, mel hoc in ſuis cellulis & capſulis tum ſemper permanſurum eſſe? vel ſimpliciſſimo enim ruſtico notum eſt, quod mel

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in aqua ſolvatur, vel in aqua ſenſim deliqueſcat, licet etiam immotum in aqua maceratum jaceat, quanto magis vero, ſi ejuſmodi mellificia continuò moveantur, jactentur, eluantur, & indeſinenter cum aqua coagitentur, uti procelloſum mare, notiſſimo modo, ſolet, unde hæ mellis cellulæ brevi tempore inevitabiliter vacuæ, & mellis expertes apparituræ eſſent, mel autem ipſum à maris aqua imbiberetur, 3^tio) Quod ſi autem teneræ illæ cellulæ melle ſuo privatæ fuerint, tum reſidua maſſa non adeo firma eſt, ut fluctibus maris ejuſque perpetuo motui reſiſtere, ſed potius niſi planè divulſa & diſpulſa, ſaltem in multas particulas dilacerata, per conſequens ab hoc motu nullatenus ſolidior, firmior, compactior, multò minus conjunctim in magna uniformi maſſa, ſicut Ambra eſt, afferri poſſet, 4to) Si vero quis, nulla hujus habita ratione, tamen inſiſteret, elutas has apium cellulas nihilominus fluctibus reſiſtere, quod etiam facilè in ipſius gratiam largiri poſſem, ſed tum quoque ſemper in eodem ſitu, vel in uno eodemque ſtatu & habitu ſe invicem continerent, conſequenter non adeo firmam, compactamque maſſam formare poſſent, ſed conſtanter ceram celluloſam, vel tabulas foraminatas repræſentarent: Ubi vero reperiuntur in Ambra ejuſmodi partes, quæ figuram excavatarum & ordine poſitarum apium cellularum ſiſtunt? Recordor equidem, quod Borellus *, Qui ratione originis Ambræ huic quoque Sectæ addictus fuit, regerat, has mellis cellulas ſeu domicilia apium poſtea in mari rebus variis repleri, ſicque mellificium æquale ac firmum reddi, verum & hæc commentatio purè eſt commentitia,

* Petr. Borell. Obſervat. Med. Phyſ. Cent. IV. Obſerv. 66.

merè

merè fiƈta, inſufficienſque effugium; Nam primò cellulæ hæ cereæ tamen cera permanſuræ eſſent, certè in pelago nulla cera replerentur, & ſecundò nemo hominum adeo erit ſtupidus, ut ſibi imaginaretur, cellulas iſtas caſu fortuito in pelago cum Ambra gryſea expleri; unde enim Ambra tum proveniret? cum tamen ab his ipſis apibus exiſtere credatur, vel qualis alia materia illa eſſe poſſet, quæ ex mari, propriô inſtinƈtu ſemet ſepararet, in his cavitatibus ſedem ſibi figeret, & tum Ambra fieret? Si hoc ita eveniret (quod tamen impoſſibile eſt) tunc id ipſum etiam opinioni illorum rurſus contradiceret, quippe quæ Originem Ambræ *tantum ab Apibus, & à nulla alia re*, deducere vult: exiſtimarem proindè, ſi quoque cellulæ mellis in ſuis tabulis vel maſſis in mari circumnatarent, & revera cum alio quopiam implerentur (quod tamen planè nondum probatum eſt) materiam hanc implentem non unius ſed variæ tam indolis quam ſubſtantiæ futuram eſſe, prout nempè hoc vel illud forte fortuna ibi nidularetur. Quam varium & multiforme id futurum, ibiquè ſe immixturum eſſet? An hæ omnes diverſæ ſubſtantiæ ſenſim in veram Ambram gryſeam converterentur? O miras imaginationes! Denique ſi etiam hæc caſu irrepta peregrina revera Ambra fierent, tum (ut jam ante dixi) ea rurſus non ab apibus provenirent, præterea cellulæ quoque cereæ adhuc permanſuræ eſſent, ut cognoſci & videri poſſint, 5to) Quod ſi alius objiceret, ceram à calore ſolis in unicam maſſam conglobari, huic reſpondeo: (*a*) ex experientia hoc non apparet, ſi apium cellulas ſoli expono, ipſaſque in eo digero, vel ullo alio modo flecto, verſo & tracto, (*b*) poſito quoque, ceram hoc pacto conglobari, tum tamen cera, ſimul-

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que aſpectu uniformis eſſet ac permaneret, quæ ſingula tamen cum Ambra gryſea, illius varietate, aſpectu, & relatione non concordant, 6to) Cera accedente flamma candelæ in & per ſe nunquam flammam concipit ante ſui liquefactionem, quod vero Ambra gryſea facit, 7mo) Cera & mel ſpecificum ſuum odorem continent atque retinent, qui cum odore Ambræ planè non convenit, 8vo) denique tota hæc claſſis vel per ſolam Chymiam rurſus convinci poteſt, ſiquidem in examinatione Ambræ ne veſtigium quidem alicujus melleæ vel cereæ Subſtantiæ inveniri aut demonſtrari potuit, nec ipſe D. Lemery * per albam illam & viſcoſam materiam, quæ in Eſſentia Ambræ præcipitatur, ſi modo accuratius eam examinabit, probare poterit, quod cera ſit, prout ille exiſtimavit, opinionemque ſuam cum ea maximoperè ſtabilire voluit. Dr. Kæmpferus, † qui ipſemet in India fuit, aperte his hominibus contradicit, præcipuè, ſi craſſam illam circumſtantiam adjiciunt, Ambram fuiſſe repertam, in qua crudum mel adhuc exſtiterit, ait enim, " Fal-
" luntur omnes recentiores Gallici Autores, qui hac
" in re Deniſium ſequantur".

Nunc quidem & alteram opinionem, qua Ambra alio rurſus modo *pro Animali producto* habetur, quoniam circa Regnum animale jam verſor, adducere deberem, verum cum hæc ejuſmodi creaturas concernat, quæ in mari vivunt, ac quidam horum ſeparatum Naturæ *Regnum*, *nempè Marinum*, quanquam abſque ulla neceſſitate, forment, & ipſemet antea dixerim, quod univerſas opiniones à plaga ſuperiori, ſcilicet ab

* Loco citat. & in ejus Curſu Chymiæ.
† Engelb. Kâmpferi Amœnitat. exotic. pag. 632, 633, 634.

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aëre inchoaturus, indeque gradatim profundius descensurus sim, hinc omnia ea, quæ ad mare pertinent, adhuc paulatim reponam, ac prius in terram me demittam, illas opiniones, quæ Regnum Vegetabile concernunt, paucis examinaturus.

Sylvaticus * primum, Ambram gryseam *Gummi* esse, inquit; quæ opinio verò, absque ulla prolixitate, tantum ex mixtione & partibus constitutivis Ambræ, statim funditus evertitur, quia Ambra nequidem ut Gummi-resina, de qua saltem aliqua pars in aqua se solvi patitur, multò minus autem ut purum Gummi, quod totum in aqua solvi debet, sese monstrat: apertè potius contrarium in Ambra apparet, adeoque nihil Gummosi hîc subest.

Alij volunt, Ambram gryseam esse *Resinam* † vel *lacrymam balsamico-resinosam* certæ cujusdam (ut perhibent) sed adhucdum incognitæ Arboris, ex his arboribus, quippe quæ proximè ad mare, vel oras littoris crescerent, destillare & defluere illam resinam in mare, in quo circumagitata, aqua salina imbibita, simulque à Sole digesta, tandem in veram Ambram excoqueretur; Verum & hæc opinio perquam fabulosa apparet: 1mo) Arbores quam propinquissimè ad mare locatas esse oporteret, si emanans resina in illud destillare ac defluere deberet, 2do) hæ arbores valdè profundas radices agere necesse haberent, ne in tanta propinquitate ab alluentibus perpetim fluctibus convellantur, subfodiantur, aut planè subvertantur & proluantur, 3^tio) si singulæ guttulæ vel defluentes exiguæ massulæ in

* In Pandect.

† Alexand. Geraldinus in Itinerario suo ad Pontif. Leon. X. ex Libavio Lib. IV. Singular. C. II. in Scholiis, pag. 320. à D^no Boyle. V. Philosophical Transactions, N° 97. pag. 6113 & *seq.*

mare

mare deciderent ac proluerentur, idque, quod decidit, ſtatim ab aqua circumdaretur, tum conjunctio perquam difficilis, ſi non impoſſibilis redderetur, & penitus incredibile eſt, quod ejuſmodi ſenſim ſenſimque in mare ſtillantes, ſtatim madefactæ & prolutæ lacrymæ unquam ita ſibi occurrere poſſint, ut in tantas moles, quæ, ſi non pondus Centenarii æquant, ſaltem in hujuſmodi ſatis grandes firmaſque maſſas, prout Ambra reperitur, propriô inſtinctû coalituræ, ſeſeque formaturæ ſint: putatitium aquæ ſalinæ auxilium, digeſtio & excoctio ſolaris in inquieto illo & ſemper frigido mari, ſunt meræ nugæ, 4to) nec rurſus de his arboribus quicquam cognitum eſt, neque nautis, neque Ambræ-piſcatoribus, nec ullis aliis in regionibus iſtis, ubi Ambra reperitur, habitantibus vel peregrinantibus hominibus, quemadmodum etiam notiſſimus ille Georgius Eberhard Rumpffius * hanc opinionem jam ſatis ſuperque refellit, 5to) denique contraria mixtio Ambræ cum oleis expreſſis, ut & cum pluribus aliis, contra hanc hypotheſin, quod ſit Vegetabilis Reſina, apertè militat.

Averrhoes, † Ambram gryſeam eſſe *Speciem Camphoræ*, ait, cum tamen ignoraverit, quid ipſa Camphora ſit, prout quoque inter Camphoram & Ambram, ratione volatilitatis, ſolubilitatis, coloris, odoris, aliarumque proprietatum plurium, tanta intercedit differentia, quanta eſt inter diem & noctem, uti cuicunque hoc ſatis conſtat.

* Valentini Oſt-Indiſche Sendſchreiben ſub N° XI. pag. 56.
† In Colliget. Cap. 56.

Alij e contra perhibent: Ambram provenire *à fructu quodam* * quem Ceti lubenter deglutiant, & ex quo in corpore ipſorum perfecta demum Ambra gryſea generetur, ſed hanc chimæram reſponſione indignam exiſtimo. Quod reſtat de putatitio ejus ex Regno Vegetabili ortu pertinet ad mare, nec continet quippiam probabilis, ſed naturæ proprietatique Ambræ apertè contrariatur.

Ut autem & hæc plenè ad finem perducam, ſtatim potius reliquas, quæ quidem forent, opiniones *de quibuſdam marinis*, nec non reſtantia *Vegetabilia* in medium producam: Julius Cæſar Scaliger & Serapius Ambram *pro ſpecie Fungi* † habuerunt, vel dixerunt, eam naſci in fundo maris adinſtar fungorum, qui tandem ſoluti alta peterent, & ad littora ejicerentur, ſed hæc opinio ſeipſam refutat, quia nullus in toto terrarum orbe reperitur fungus, qui non certam characteriſticam formam ſeu figuram poſideat, quæ tamen circumſtantia tam malè, quam mixtio fungorum, cum Ambra convenit.

Libavius ‖ & Weckerus ** volunt, Ambra gryſeam eſſe *Spumam maris*, ſed hi, ne multas graviores oppoſitiones adducamus, vel hâc ſolâ circumſtantiâ falſitatis arguuntur & convincuntur, quod in plurimis illis locis, in quibus mare omnium vehementiſſime ſpumat, & bullas format, vel ubi ſpuma maris eſt copioſiſſima, nulla plane Ambra reperiatur, quæ tamen, ſi hypotheſis ipſorum vera eſſet, copioſiſſima ibi exiſtere deberet.

* Nic. Monard. de Simplicibus Medicam. Edit. Plantin. Antv. pag. 13.
† Juſti Fidi Klobij Ambræ Hiſtoriæ, pag. 18.
‖ Libr. IV. Singularium, Cap. I.
** Weckerus in ſpeciali Libr. Sect. II. p. 79. item, Sylvaticus in Pandect.

Hierony-

Hieronymus Cardanus *, Ambram *Sperma Ceti* esse perhibet, quantum vero Sperma Ceti ab Ambra gryseа differat, unicuique sufficienter patet, unde etiam non opus erit, huic apertè falsæ hypothesi prolixis contrariis argumentis occurrere.

Eichstadius † & Fragosus ‖ referunt, Ambram esse *jecur* cujusdam piscis; verum cuique notum est, quod jecur suam capsulam seu parenchyma habeat, atque ex filamentis venarum & arteriarum consistat, quæ singula nullatenus in Ambra reperiuntur, ut taceam, quod hepar destillatum longe alia producta fundat, quam quæ ex Ambra per destillationem nanciscimur.

Plurimi, *Regno* sic dicto *Marino* adhærentes, existimarunt, Ambram gryseam *ex piscibus* prodire, hæ tamen opiniones variô rursus modô sese divisc-runt, quæ vero primò in tres classes generales distribui poterunt, hæ autem postea in varios denuò minores ramulos seu subdivisiones dispesci deberent, si ordine omnes adducere, considerare & dijudicare vellemus.

Ut verò parvam tantum hujus rei Ideam jam proponamus, aiunt 1mo) quidam, quod Ambra gryseа planè in piscibus *generetur*, 2do) alij, & quidem rationi convenientiùs, dicunt, Pisces fluctivagam in Mari Ambram *deglutire*, 3^tiæ) denique classis qui sunt, nihil positivi definiunt, *neutro modo sese habent*, & tantum perhibent, Ambram gryseam in piscibus reperiri, interim non memorant, an ea in his piscibus generetur, vel an ab iis antea deglutiatur? Ex tribus principalioribus hisce opinionibus postea permultæ subdivisiones ortæ sunt, tam ratione pis-

* De Subtilitat. pag. 284.
† In Libr. de Confect. Alkermes, Cap. XII.
‖ In Libr. de Medicam ex India in Europ. delatis Cap. de Ambaro, p. 89.

cium quam deglutitionis & generationis. (*a* Ad piſces quod attinet, quidam aſunt: 1.) Ambram tantum in piſcibus majoribus, alij autem, 2.) etiam in minoribus, 3.) quidam, eam in omnibus Cetis, (4) alij contra, ſolùm in certa ſpecie Balænæ reperiri, quanquam & hi rurſus (5) in denominatione hujus ſpeciei differant; (*b*) Circa deglutitionem itidem differunt, alij etenim, 1.) Ambra ab omnibus piſcibus cum aviditate deglutiri ferunt, alii autem 2.) de unica tantum ſpecie id prædicant; 3.) quidam, piſces exindè mori, alii verò, 4.) nihil ipſis nocere affirmant; 5) nonnulli aiunt, quod deglutita Ambra cito rurſus evomatur, 6.) alij vero, quod per alvum deji iatur, 7.) adhuc alij, Ambram non tantum à piſcibus, ſed ab aliis etiam animalibus comedi & deglutiri contendunt. Et ſic quoque (*c*) ratione generationis varia ſchiſmata vel diverſæ opiniones ſunt, tam (1.) Quomodo, quam etiam (2.) ubi generetur? porro (3.) an ſit excrementum, vel (4) recrementum? Et quæ ulterius occurrunt diſcrepantiæ.

Omnes has adeo differentes opiniones ex ordine luſtrare non tantum nimis prolixum & ſupervacuum, ſed parvi etiam, nulliuſque uſus eſſe exiſtimo, unde ſolùm principales earum promiſcuè attingam, & ſic magis magiſque ad rem ipſam accedam.

Clariſſimus Rumpffius *, cui alias equidem fides adhibetur, præcipuè cum etiam Gabriel Nakke, aliique plures, ea, quæ ipſe dixit, confirmarunt, in literis ſuis ex Inſula Amboina ad D. Ten Rhyne datis expreſſe ait: non tantum *majores Cetos*, ſed *minores* etiam *piſces*, item *aves* & *apros* (nonnulli quoque

* Loco citat. Valentini ſub N° 8. pag. 50.

vulpes

vulpes nominant) magna cum aviditate proportionata fruſta Ambræ gryſeæ deglutire, ubi illa capere aut reperire poſſint, quæ verò poſtea rurſus evomerent, qua occaſione hæc ſimul verba adducit: exinde ortum eſt, quod non ſolum in vulgo, ſed & in tot autoribus tam variæ opiniones de Ambra diſſeminatæ ſint, dum alius de Cetis, alius de porcis ambriferis ſcribit aut loquitur, & uterque putat, eam in his animalibus generari, in quibus tamen *fortuitò* tantum reperitur, quippe quæ ipſam antea deglutiverunt.

Ex iis, qui opinionem fovent, Ambram ſolummodo *in unico piſce* & certa Balænæ ſpecie reperiri, ſunt 1.) quidam, qui hunc piſcem Azel * appellant, ſimul perhibentes, quod ille piſcis Ambram gryſeam avidiſſime *deglutiat*, exindè vero brevi poſt ipſi moriendum ſit, quem tum piſcatores cum induſtria perveſtigarent, 2) alij hunc piſcem Mokos † vocant, unà referentes, quod tres vel quatuor orgyas longitudine exſuperet, in India Orientali degat, & circa Japoniam capiatur, 3.) alij, ex quibus eſt ille, diu in India Orientiali moratus, D. Andreas Cleyer, piſcem hunc vocant Cetum Ambrophagum, ſive Ambram vorantem, idemque ejus delineationem olim ad D. quondam Mentzelium huc Berolinum tranſmiſit, qui eam unâ cum Cleyeri relatione Academiæ Naturæ curioforum Cæſareæ communicavit, à qua hæc omnia Anno VIII. Dec. II. ſuarum Obſervationum publici juris facta, ſunt, 4) adhuc alij dicunt, quod ſit certum genus Cetorum ad Lamias pertinens ‖, rurſus

* Geſnerus de Aquatil. & quidem de Cetis diverſis Libr. IV. pag. 204.
† Kæmpferi Amœnitat. exotic. Faſcicul. III. pag. 635.
‖ Valentini Oſt-Indiſche Sendſchreiben, pag. 50.

alij

alij (5. & inter hos, ille in America degens D^us Paul Dudley, exiſtimant, Ambram gryſeam tantùm ac unicè ab iſta Balænæ ſpecie, vel ab illo Ceto provenire, qui Sperma Ceti ſuppeditat.

Multi, qui in opinionibus *neutram partem* eligunt, & quidem dicunt, quod Ambra in piſcibus, ſed non in certo quodam ſingulari piſce, verùm communiter in omnibus belluis in genere reperiatur, nec decidunt controverſiam: an Ambra ab iis deglutiatur, vel inibi generetur, in hoc tantum differunt, quod non *unum eundemque locum* Ambræ in piſce deſignent, nam (1mo alij eorum, & plurimi quidem aiunt, quod Balænæ eam contineant *in ſtomacho* (2do alii, *in inteſtinis*; unde ex his rurſus quidam ſurrexerunt dicentes: (*a*) Balænam *evomere* & *per ſuperiora eructare* Ambram, (*b*) alij vero, eam *per alvum, ſeu laxando* per inferiora ejicere contendunt; interim hæ opiniones univerſæ *ad unum idemque redeunt*, & in fundamento tacitè concordant, Ambram gryſeam ſcilicet in piſcibus non generari, ſed ab iis *potius deglutiri*. Siquidem 1.) hoc per ſe clare patet, ſive quid per os, ſive per alvum ejiciatur, neceſſe eſt *antea in ventriculo fuiſſe*. 2.) illud, *quod evomitur, certò è ventriculo prodit*, ſi ergo Ambra, quæ in ventriculo eſt, per vomitum non eliminatur, ſed retinetur, tum facilè ſecundum viam naturalem ulterius per inteſtina, & tandem ex his planè exire poteſt, quæ omnia, ſive in ventriculo, ſive in inteſtinis reperiatur, ſive evomatur, ſeu per alvum ejiciatur, neminem in admirationem rapere queunt, nec realem differentiam, ſed unam eandemque rem conſtituunt, 3.) Notum eſt, quod in ventriculo naturaliter nihil niſi *liquidi ſucci* ſint, & illuc pertingere

pertingere valeant, è contra omne aliud, præcipuè *ſolidæ & ſubſtantiales compactæ materiæ* neceſſariò per os ingredi, & ſic ulterius deglutiri debeant. Si igitur Ambra gryſea revera in ventriculo vel inteſtinis Balænæ reperi ur, quomodo judicioſus homo ſibi imaginari poterit, quod ibi à natura, vel in piſce illo generata fuerit? Nonne potius Naturæ magis conveniens eſt, hanc materiam nullatenus in Animali hoc generatam, ſed utique primum extra hunc piſcem exſtitiſſe. ac poſtea tanquam eſcale quoddam deglutitam fuiſſe? prout etiam *quamplurimi* itidem fide digni Autores, licet in hoc differant, quod alter, Ambram à balænis evomi, alter, per alvum ejici, tertius, in ventriculo reperiri, & quartus, eam in inteſtinis occurrere, dicat, in hac tamen circumſtantia, tanquam in certa & indubia veritate *conveniunt*, Ambram gryſeam à piſcibus *deglutiri, nulloque modo in iis generari.*

Interim antedictæ circumſtantiæ, quod 1.) quidam viderint, quomodo Cetus Ambram evomat, 2.) vel per alvum ejiciat, 3.) vel in mortuis, ſive violenta, ſive naturali morte peremtis Cetis, aut in horum ſtomacho vel inteſtinis quædam Ambra reperta fuerit, ad hanc tamen ſeductionem anſam rurſus præbuerunt, quod multi crediderint, & adhuc credant, præcipuè Incolæ Inſulæ Madagaſcar, item plurimi piſcatores & nautæ, Ambram gryſeam nihil aliud eſſe, quam *Excrementum Belluæ.* Japonenſes eam Ambram, quam in piſcibus reperiunt, vel quæ à piſcibus rurſus ejecta eſt, in ſua lingua vocant Kuſura no fuu, quod ſtercus Balænarum denotare dicitur *.

* Kæmpfer. Loco citat. pag. 635.

D. Joh.

D. Joh. Matth. Faber ait : ſi Cetus deglutitam Ambram ſive vomendo ſive laxando rurſus ejiciat, tum equidem tolerari poſſet, ſi illam vulgus *Excrementum ſive ſtercus Balænæ* appellaret, ſed hoc totam rem plane nondum affirmare aut decidere, nec judicioſos viros exindè credituros eſſe, quod Ambra, quatenus vera, & pro ea accepta, propterea verè Excrementum vel ſtercus Balænæ ſit. Liceat mihi adducere hujus rei exemplum : Mercurius currens, vel globuli Reguli Antimonij, qui aliàs etiam Pilulæ perpetuæ vocantur, per os aſſumuntur, viciſſimque ejiciuntur, tum alius ea iterum per os aſſumit, & ſic Pilulæ benè ablutæ, ac Mercurius currens, decem, viginti, pluribuſque hominibus propinari poſſunt, ex his alius illa mox rurſus ejicit, alius autem diutius ſecum retinet, quinimo tertius fortè ea non planè rejicit, ſed cum iis moritur, id quod, ab ingeſtione Mercurij in paſſione iliaca ſic eveniſſe ipſe vidi, ſi autem Mercurius vel globuli regulini tandem ab homine vivo denuò ejicerentur, vel in corpore hominis demortui reperirentur, & omne adhuc verus Mercurius vivus, vel Regulus Antimonij eſſet, quis hominum ideo has res poſtea *animale quippiam* vocaret, aut pro *animali materia* haberet, quoniam ſcilicet in corpore humano fuerint ? vel quis ſana mente præditus hunc Mercurium vivum, aut Regulum Antimonii pro ſtercore humano æſtimaret, vel ejuſmodi metallica Subjecta Excrementum humanum appellaret, eam ob cauſam, quia homo illa per alvum rejecit ? ipſe profectò mulierculæ eum deriderent, licet aſſereret, quod hæ materiæ vel à centum hominibus ſucceſſivè deglutitæ, ſemperque rurſus egeſtæ, aut etiam per longum ſatis tempus in corpore humano retentæ

retentæ fuerint Mercurius currens & Regulus Antimonii crudus, quamdiu in metallica ſua forma viciſſim in conſpectum veniunt, proptereà nec ſunt, nec fiunt animale quicquam, etiamſi à mille animalibus deglutiti, ac per aliquot annos retenti fuiſſent.

Eadem quoque eſt ratio circa deglutitionem & inſequentem egeſtionem Ambræ gryſeæ: hæc equidem non eſt ejuſmodi metallica materia, qualem Antimonii regulum vel Mercurium vivum videmus, revera tamen eſt minerale, & nullatenus animale concretum, prout poſteà ſuo loco audiemus, hac vice ſequentia tantum adjiciam: Ambra ad minimum, peregrinum, ac in mari natans corpus eſt, quod piſces cum tanta aviditate, & tanquam delicatum ferculum, fortè ut homines fungos eſculentos, tubera terræ eſcalia, aliaque fungorum genera, deglutiunt, ſed itidem indigeſtum rurſus ejiciunt. Quod Ambra piſcibus peregrinum quiddam, & apeptus cibus ſit, patet *ex pleriſque relationibus*, indeque prodeuntibus Scriptis; non equidem prolixè antedictum piſcem Azel in fidem adducam, de quo expreſſe ſcribunt, quod Ambram lubentiſſime deglutiat, abinde vero brevi poſt *moriatur*, ſed ad id tantum animum advertam, quod plerique referant, piſces deglutitam Ambram rurſus *evomere, vel per alvum rejicere*, & indubiæ veritatis eſt, quod *perquam rarò* Ambra quædam in piſcibus ipſis, adhuc in ventriculo vel inteſtinis commorans, reperiatur. Monardes alicubi, " veriſſimum eſt, inquit, meo tempore in regione " Inſularum Canarienſium, quas Inſulas fortunatas " appellant, in Balæna quadam, vel potius *in ejus* " *inteſtinis*, centum libras Ambræ repertas fuiſſe: Pergit autem dicens; " Ab illo tempore *perma-* " *gnus* balænarum minorum ac majorum *numerus* " necatus eſt, ſed N. B. in nulla earum quicquam hu-

" jus Ambræ repertum fuit *". His addo, quod in multis balænarum centuriis nulla Ambra reperta ſit, nec reperietur, & quod ea, quæ interdum inibi reperitur, *aut brevi antea deglutita, aut caſu fortuito* ibi retenta fuerit, adeoque vel propter molem compactiorem, vel aliud quoddam impedimentum, ſi non propter morbum, per inteſtina tranſire, ſicque exitum ſuum capere nequiverit.

Manet itaque indubitanter firmum & certum, quod Ambra gryſea à variis piſcibus, præprimis autem à balænis 1.) *deglutiatur*, 2.) poſteà *vel evomatur*, 3.) vel *per alvum* excernatur, 4.) vel quoque interdum *in iis retineatur*, & poſt mortem aut *in eorum ventriculo, aut inteſtinis* reperiatur, prout hæ circumſtantiæ non modo ab uno vel duobus, ſed à permultis etiam fide-dignis perſonis, ex parte quoque jam à longinquo tempore unanimiter relatæ & confirmatæ ſunt ; ſed ex his plane non concludendum eſt, ac ſi Ambra gryſea in ventriculo & inteſtinis horum piſcium *generetur*, vel eam ob cauſam, quia per aliquot tempus in corpore horum animalium fuit, jam *animale quippiam* facta, vel idcirco *Regno animali* jam *accenſenda* ſit.

Ultima opinio, quæ huc referri poteſt, & quæ multos quoque fui Fautores habuit & adhuc habet, imo per duas, ex America ad Regiam Societatem ante paucos annos, tranſmiſſas Relationes inprimis excitata, & tanquam nova, certa, veraque detectio orbi notificata eſt, in eo conſiſtit, quod Ambra gryſea pro *Recremento Animali*, & quidem pro *Recremento Ceti* reputetur, ſeu pro materia, quæ in Ceto ut ſingulare aliquid generetur, cujus rei analogiſmum adducunt, ſicut Caſtoreum in Caſtore, Moſchus in animali moſchifero, Zibethum in cato zibethino, ſeu Hyæna odorifera, vel Bezoar in capris illud ferentibus, &c.

Continuabitur hæc Diſſertatio in N° *ſeq.*

* Fabr. Lyncei Expoſit. in Anton. Rech. Edit. Roman. pag. 572.

Numb. 434.

PHILOSOPHICAL TRANSACTIONS

For the Months of *Septemb.* *Octob.* and *Nov.* 1734.

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II. *An Account of a* new Engine for raiſing Water, *in which Horſes or other Animals draw without any loſs of Power (which has never yet been practiſed) and how the Strokes of the* Piſtons *may be made of any Length, to prevent the loſs of* Water, *by the too frequent opening of* Valves, *with many other Advantages altogether new; the Model of which was ſhewn to the* Royal Society *on the* 28th *of* November, *by* Walter Churchman, *the Inventor of it.*

III. *An*

The CONTENTS.

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V. *An Account, by Dr.* Richard-Middleton Massey, *of a Book, entituled* Locupletissimi Rerum Naturalium Thesauri, *accurata Descriptio, &c.* Vol. I. Amstel. 1734. *in* Folio. *An exact Description of the principal Curiosities of Nature, in the large* Museum *of* Albertus Seba, *F. R. S. Vol.* I. Amsterdam, 1734.

Jos: Banks

Printed for W. INNYS and R. MANBY, Printers to the *Royal Society*, at the West-End of St. *Paul's*.

M DCCXXXV.

A Perspective View of Mr. Church

a a a a a. *The great Frame. the ends of which under the Pine-Apples are to be contracted to the place of the little Frame, so that the Cross piece at* III *may support ye 3 bearings now shewn in the little one, for a better view only.*

b b. *The little frame on wch the Cap Brasses are, wch receive the turnd T Gudgeons in the 3 Horizontal Shafts.*

c c. *The Strong Supporters by the loose Wallowers.*

d d. *The loose Wallowers, whose turnd rounds goe truly with ye Cogs in ye great Wheel.*

e e e. *The Regulator, wch has a Circular, direct, and retrograde Motion, see this in the Margins at Fig. 2 & 3.*

f f. *The Strong Shoulder or Stud fixd to the Shaft close by ye Wallower, which Stops this loose Wallower when ye end of ye regulater comes against it, thereby confining it for 2 Revolutions; after which it quits this Stud, & does the same on the opposite side of the Wheel, & so on Alternately, to reverse ye Motion of the Stems in the different Cylinders.*

g g. *The Wheels, with their Cogs, which Alternately work ye fixd Wallower lying between them.*

h. *The fixd Wallower supposd to be of four Feet in Diameter, on a very short Shaft, whose rounds must be of Cast Soft Iron, & truly turnd, to elevate & depress the Racks to ye Height of 24 Feet by its 2 Revolutions.*

iiii. *The 4 Lifters or Forcers, behind each of wch must be a small Leverage back Wheel, truly fitted to direct the same to rise and fall easily & exactly perpendicular, to avoid friction & Loss of Water in ye Cylinders.*

k k. *The large vertical Wheel, a small Segment of wch comes through ye Floor in ye Dome for ye 4 Horses to stand & Draw on.*

l m. *The arms, & ye main Shaft of the Same.*

n. *The turnd T Gudgeon, with its Collar & Shoulder, both of wch must Clasp ye rim of the under Leverage Wheel, to keep all firm & Steady when in working.*

o. *The Leverage wheel of about 4 feet in Diameter, with a Brass or Iron rim supposid to be truly turnd, and to have a Strong short Iron Spindle through its Center, & at each end a turnd Steel Collar & Shoulder bearing on 2 Cast Cap Brasses exactly level, & sunk into a Strong Arched piece of Timber well braced and Supported for this purpose.* *



Fig. 3.

The Arms lie horizontal, and the oval part is perpendicular.

N.B. A single Shaft with the loose and fixd Wallowers, will be of great simplicity and advantage to the Public lifting or forceing, at either of its ends, or at both together: but chiefly, as it is easily adapted to the different sorts of purposes Vid. Fig. 2 in the Margin. The Pins 4.4. & the arms 5.5. which clasp the brasses 6.6. with the oval figu

* *In large Engines & Machines where the motion is regular every heavy bearing should have one of these Wheels for, they save Power by greatly abating Friction. Upon the Principle*

Philos. Trans. N.° 434

RCHMAN'S ENGINE for raising Water.



pp. Two small side Leverage Wheels exactly fitted to y^e^ turn'd part of y^e^ great Gudgeon, between y^e^ Collar & Shoulder: they are to be so placid & key'd, that their friction from ye Gudgeon may be alike when at Work.

qq. The Steps which the Horses feet pres, about 8 or 9 Inches broad, 2 Inches thick behind, & declining to an edge; being design'd to make level ground & good footing for their hinder Leggs when they Draw.

rr. 4 Horses only in view to avoid Confusion, all drawing Horizontally in a streight line & at right Angles, whereby these useful Animals will soon be taught a new & pleasant way of working to themselves, a more advantagious one to their Masters, & of greater Utility to ye Publick. See my observations on ye advantages of this Engine above others in ye Philos. Transac.^ns^ N.° 434

s. The fastening places behind ye Horses, Supposed to be strong arms below in ye supporter, & a cross bar above, at both of wch you may place small Sheeves or Rollers, ye upper part of them to be level with each Horses breast when drawing, & the Rope or Strap to come over ye same, in order to keep a weight suspended of £300 more or less one or two Inches from a Plank. By this Method you will be exactly inform'd of ye Strength of each Horse, how long it continues, & when to relieve him, as Also when justly to correct ye Slothfull one, whose weight resting on ye Plank will always discover his Lazyness.

t. The fastening places before being design'd to direct their heads.

u. The Dome merely for Ornam.^t^ in ye place of wch erect a Workhouse, over ye a horizontal Windmill: on ye lower end of its upright Shaft, fix a Spur Wheel to work with the Leggs of ye great Wheel, thereby to assist ye Horses, or w.^n^ there is a sufficient force of Wind to do their whole Duty.

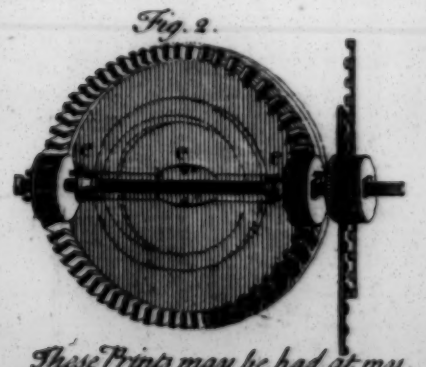
w. The Coupling Staples with their Brasses.

x. The Strong Catch wch confines ye great Wheel to the Frame.

y. The Screw or Key band to confine all close & tight.

z. The Cylinders wch are screw'd together at their ends out of sight &c. All y^e^ same sort of Work chiefly for Uniformity in y^e^ Draught.

Fig. 2.

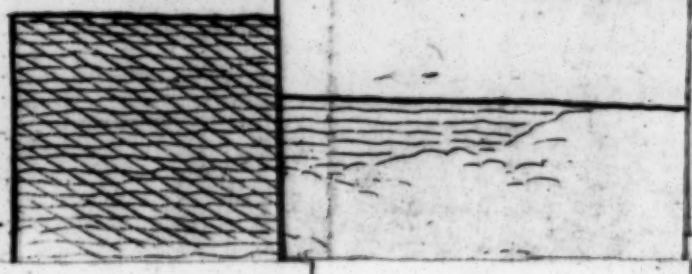


e to the Publick, as being erected for less expence, and as it will work pleasantly any number of Racks for erent sorts of Windmills, Waterwheels, &c. of all denominations already in use. It also serves for small h the oval figure 7 & it's 2 teeth make this Regulator, which is work'd by the Staid in the main Shaft. ——

on the Principle of these Leverage Wheels Captain Bowe has publish'd what he calls his Friction Wheels the subsequent to my Specification thereof.

These Prints may be had at my
Chocolate-Warehouses
in S.t Paul's Church y.d London.
and in Broad-Mead Bristol

A Pe RCH



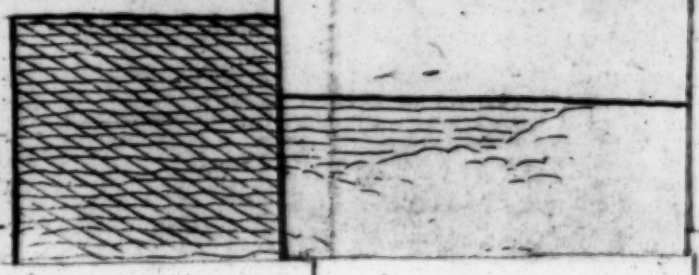
a.a.a.a. Is the great Frame, the ends of which under the Pine-Apples are to be contracted to the place of the little Frame, so that

I. De AMBRA GRYSEA. *Auctore* Caſparo Neumanno, M. D. *Chemiæ Profeſſ. Berolin. & R. S. S.* [Vide PART I. N°. 433.]

PARS II.

CEleberrimæ Societati Regiæ adhuc in recenti erit memoria, quod in Tranſactionibus Veſtris Philoſophicis duæ de hac materia ſingulares ex America tranſmiſſæ Relationes, altera 1724, ſub N° 385, & altera 1725, ſub N° 387 exſtent, quarum prior à Dno Boylſton, poſterior vero a Dno Paulo Dudley, digniſſimo illuſtris hujus Societatis membro, communicata eſt, nec minus, quod utrique opinionem ſummariter antedictam ſtatuant & defendant. Jure meritoque equidem veneror ac laudo virorum horum ſinceram intentionem, impenſam operam, atque communicationem, & optandum eſſet, ut plures ejuſmodi indagatores & ſcrutatores ignotarum adhuc, incertarumque ad Rem medicam ſpectantium rerum naturalium reperirentur, quærendo enim & ſcrutando varia ubique in lucem producta ſunt: Interim, cum propter eundem hunc finem totæ Eruditorum Societates in orbe fundatæ ſint, ut plures quam unus, duo vel tres in variis tam naturalibus quam artificialibus commodo

A Pe RCH



a.a.a.a. Is the great Frame. the ends of which under the Pine-Apples are to be contracted to the place of the little Frame, so that

I. De AMBRA GRYSEA. *Auctore* Caſparo Neumanno, M. D. *Chemiæ Profeſſ. Berolin. & R. S. S.* [Vide PART I. N°. 433.]

PARS II.

CEleberrimæ Societati Regiæ adhuc in recenti erit memoria, quod in Tranſactionibus Veſtris Philoſophicis duæ de hac materia ſingulares ex America tranſmiſſæ Relationes, altera 1724, ſub N° 385, & altera 1725, ſub N° 387 exſtent, quarum prior à D^no^ Boylſton, poſterior vero a D^no^ Paulo Dudley, digniſſimo illuſtris hujus Societatis membro, communicata eſt, nec minus, quod utrique opinionem ſummariter antedictam ſtatuant & defendant. Jure meritoque equidem veneror ac laudo virorum horum ſinceram intentionem, impenſam operam, atque communicationem, & optandum eſſet, ut plures ejuſmodi indagatores & ſcrutatores ignotarum adhuc, incertarumque ad Rem medicam ſpectantium rerum naturalium reperirentur, quærendo enim & ſcrutando varia ubique in lucem producta ſunt : Interim, cum propter eundem hunc finem totæ Eruditorum Societates in orbe fundatæ ſint, ut plures quam unus, duo vel tres in variis tam naturalibus quam artificialibus commodo

publico inſervientibus rebus & intentionibus ſimul quærere, ſcrutari, perpendere, laborare, & ad hanc vel illam certitudinem adſpirare debeant; ego vero de his duabus Relationibus, quatenus Ambra gryſea *pro vero Animali*, ſeu *in Ceto generato Concreto* habetur, apertum dubium foveam; ſpero, me non contra fundationem & intentionem Societatis impingere, ſi, tanquam tenue illius membrum cauſas mei dubii una cum antitheſi mea itidem tranſmitto, eaque perſpicaciſſimo veſtro corpori pro ulteriori judicio relinquo. Minime autem hæc animo meo inhabitat opinio, ut antedictis duobus Clariſſimis Viris nudè tantum contradicere vellem, ſed ſolummodo ut adjuvem hanc ſcrutationem & indagationem, quatenus occaſio & viæ mihi ſuppetunt, vel prout ratione mearum circumſtantiarum & ſtudiorum de iis participare poſſum, ſub quo principaliter *indagationem & perſcrutationem, quæ fit adminiculo chymiæ*, intellectum volo. Metallarius e. gr. quærit mineras, lapides, ſalia, bitumina, terras & ſimilia: Chymicus Metallurgus examinat, ſeparat, purificat, & poſtea prius declarat, quodvis ſeparatim & ſpecificè, quid reverà & demonſtrabiliter ſint, probat primùm, quod hæ res vera mineralia & non fortè ſub terram olim defoſſa & ad alia Naturæ Regna pertinentia concreta ſint, quod Cryſtallus mineralis, quæ figuram ſalis repræſentat, tamen non ſit ſal, nec ſalia ſint lapides cryſtallini, & quod ii pyritæ, qui auri puriſſimi adinſtar fulgent, ſeu mineralia flavè-nitentia concrementa (vulgò Druſen) non ſint verum aurum. Hortulanus quærit, ſcrutationeque perſequitur varios pulchros amœnoſque flores, ac ſapidos fructus plantare, colere,

colere, ſæpè quoque hortum ad externum modò aſpectum condecorare: Ipſe Botanicus quotidiè adhuc operam navat, gramina multivaria ignota, aliaſque plantas magis magiſque cognoſcendi, detegit nova genera & ſpecies, ſuumque ſolummodò, qua Botanicus, quantum poteſt, efficit officium; Chymicus contra indagat circa novas haſce plantas, quæ realia & activa principia contineant, an ſint medicinales, edules, purgantes vel adſtringentes, cauſticæ vel narcoticæ, ſalutares vel planè venenoſæ, an oleoſas vel ſalinas, reſinoſas vel mucilaginoſas aut alias partes, & in qua proportione eas contineant? Qui Grewi & Malpighij guſtum habent, illarum plantarum modum vegetationis, naturam glandularum, humorum, eorumque circulationem ac ſubtilem phyſicum naturalem ſtatum (quaſi phyſiologicum) ſcrutantur, alius è contra contemplatur earum partes genitales, ovarium, vaſa ſpermatica, propagativa, copulativa & multiplicativa, an hermaphroditicè vel aliter exiſtant? In Regno quoque Animali venator & Piſcator munere ſuo funguntur, vel etiam Anatomicus, quantum ad ſuam indagationem pertinere poteſt, ſic & Chymicus ſuum rurſus facit officium, quod nec Anatomicus, nec Venator, neque Piſcator debuit vel potuit perficere: Nihilo ſecius circa varias alias res variæ perſonæ, eruditi, artifices, agricultores & opifices ſuum ſæpè contribuunt, ita ut indagatio ac perſcrutatio unius ejuſdemque rei *à permultis diverſis perſonis* ſimul ſuſcipi, verificari, & in ſuo genere ad finem perduci poſſit. Omnia hæc idcirco tantum præliminariter adduxi, quo mentem meam explicem, quod indagationis Naturæ Ambræ gryſeæ, pro mea

parte, in ſpecie quatenus Chymicus, ſollicitus fuerim, quamvis etiam præter indagationem chymicam, in ante memoratis duabus Relationibus diverſæ mihi occurrant circumſtantiæ, quæ dubium meum notabiliter adaugent, quæque, ut exiſtimo, fortè etiam aliis perſonis, ſi abſque præjudicio eas conſiderave-rint, in mentem venient.

Inutile cenſeo, utraſque impreſſas relationes verbotenus hic repetere, ſed principaliora tantum membra cum quibuſdam circumſtantiis, præcipuè quæ D. Dudley, pag. 267, & 268 ſequentibus verbis enarrat adducam, ait autem,

1. Ambra gryſea tantum & unicè in illis Balænis reperitur, quæ ſperma Ceti largiuntur, &
2. Conſiſtit in globis ſeu rotundis fruſtis diverſæ magnitudinis, circiter 3 ad 12 uſque pollices in diametro, quivis globus ponderat 1½ uſque ad 22 libras.
3. Jacent hi, abſque adhæſione, in magno ovali ſacco vel *veſica*, quæ 3, vel 4 pedes longitudine, latitudine verò 2, vel 3 pedes exſuperat, utplurimùm *figuram veſicæ bubulæ* ſiſtit, exceptò, quod extremitates paulo magis acuminatæ ſint, & ferè figuram longi follis, quo fabri ferrarij utuntur, habeant ; adhæc
4. *Fiſtula* quadam præditi ſint, quæ tam *in penem, quam etiam ſecundum longitudinem per penem* deſcendat.
5. Porro *ductu quodam*, ſeu canali, qui ex altera ſacci extremitate in ipſum ſaccum dehiſcat, & ſe aperiat, ac

6. *A regionibus renum* proveniat.
7. Hic Saccus jacet *rectà ſuper teſticulis*, qui longitudine pedem unum adæquant, & ad radicem penis ſecundum longitudinem ſitus eſt, 4, vel 5 circiter pedes ſub umbilico, atque 3, vel 4 pedes ſuper ano.
8. Plerumque impletus eſt *liquore* obſcurè flavo, qualis eſt aurantiorum, qui *tenuior apparet oleo, graviſque odoris*, & quidem gravioris, interim tamen *ejuſdem indolis*, prout globi Ambræ gryſea olent, qui quoque in eo, abſque adhæſione, *circumnatant*.
9. Internum veſicæ latus profundè coloratum eſt *eo ipſo colore*, quo liquor, quod etiam *in canali penis* itidem ſic reperitur.
10. Globi ſatis duri ac ſolidi eſſe videntur, quamdiu Cetus vivit, ſiquidem perſæpè obvenit, dum ſaccus aperitur,
11. Quod concavi quidam cortices in eo jaceant, ejuſdem ſubſtantiæ & conſiſtentiæ ac ipſi globi, à quibus decorticati, vel ut feſtucæ detruſi ſunt.
12. Quique ex meris ejuſmodi *diſtinctis corticibus* vel ſtratis, ubi alius ſuper alium ſemper ſitus eſt, *ceparum adinſtar*, conſiſtere videntur.
13. Numerum globorum quod concernit, iſte in una veſica nunquam quaternarium ſuperat, referente D^no^ Atkins, qui tempore quodam unicum tantum 21 libras ponderantem reperiſſe affirmat, atque hunc *omnium maximum* fuiſſe, quem hactenus vidiſſet.

Porro in hac relatione perhibetur, quod

14. Illi,

14. Illi, qui capturæ Cetorum operam dant, obſervaverint, *veteres tantum & permagnos*, ſolummodóque ſexus maſculini Cetos, Ambram in ſe continere? ſimul tamen Dⁿ Atkins refert,

15. Se nunquam vidiſſe, nec pro certo audiviſſe, Balænam fœminini ſexus ex eo genere, quod ſperma Ceti largitur, captam fuiſſe, quoad ipſe vixerit: ſexum quippe fœmininum hujus ſpeciei *longe eſſe timidiorem* quam maſculinum, unde earum captura impoſſibilis ſit, niſi forte (ſecundâ fortunâ) eas dormientes ex improviſo ſupervenirent, vel ipſæ à catulis ſuis detineantur; hoc intereà pro certo affirmat, cymbas illis vigilantibus appropinquare non poſſe, dum maximoperè timidi & pavidi ſint. Addit his Dⁿ Atkins,

16. Quod in reſpectu unius talis piſcis, hoſce globos continentis, facilè duo eorum reperiantur, *qui nullos*, vel nihil amplius, quam ante memoratum liquorem obſcurè aurantium in ſaccis ſuis haberent, denique &

17. Gloriatur quidem Ds. Dudley in ſua Relatione mox in principio, p. 266, poſt tam diuturnam de Ambra gryſea incertitudinem, tandem cum tempore, tanquam veritatis filia, detectum eſſe, quod occultum hoc naturæ nihil aliud, quam *productio animalis* ſit, ac in corpore iſtius Balænæ, quæ Sperma Ceti ſuppeditat, excludatur vel generetur, ſicut Moſchus, &c. & p. 269, vel circa finem ſuæ Relationis ait: Spero, fore ut Societas tenui meæ regioni honorem *detectionis*, vel ad minimum *certificationis* originis & naturæ Ambræ gryſeæ attributura ſit; nihilo tamen minus,

18. Ipſe

18. Ipſe brevi ante fatetur, quod ſemetipſum concernat, ſe propriam opinionem de hac re proferre non audere, ſed cum eo contentum eſſe, quod ipſi, tanquam verum *relatum ſit*: Quæ vero relatio

19. Maxima ex parte à Dⁿ Atkins, per 10, vel 12 annos *capturæ Ceti* incumbente, & à quibuſdam aliis, circa hunc tractum, degentibus viris, ob capturam Cetorum famoſis, impetrata fuit.

In Relatione D Boylſton præcipua ſumma, p. 193, conſiſtit in ſequentibus.

(*a*) Ambram gryſeam in nullo alio Ceto, niſi in eo, qui Sperma Ceti ſuppeditat, & quidem maſculo, inveniri, atque in uno ſcilicet *ad* 20 *plus minus* libras.

(*b*) *Ex centum ejuſmodi piſcibus* vix in uno aliquid Ambræ repertum eſſe.

(*c*) Eam in cyſtide *vel ſacco* quodam reperiri.

(*d*) Quod hunc ſaccum interdum *vacuum*, interim tamen integrum offenderint.

(*e*) Quod hic ſaccus nunquam in alio loco, niſi circa *partes genitales*, occurrat.

(*f*) Ambram hanc gryſeam, dum primum eximitur, humidam & perquam penetrantis, adverſi tamen & *offendentis* odoris eſſe.

(*g*) An vero Ambra gryſea naturaliter vel accidentaliter in hoc piſce producatur? ſe eruditis ad determinandum relinquere; &

(*h*) Tandem, quod etiam ſuam Relationem *à piſcatoribus tantum, vel Ceti captatoribus* acceperit.

Patet

Patet ergo ex omnibus hiſce adductis.

(1. Relationes duas memoratas in quibuſdam partibus convenire.

(2. In quibuſdam verò etiam diſcrepare, quæ tamen differentia quæſtioni principaliori minimè contrariatur.

(A. Utræque in his conveniunt: (1.) quod memorata Ambra tantum in cetis maſculis ejus ſpeciei, quæ Sperma Ceti ſuppeditat, reperiatur, (2.) quod hæc Ambra *in cyſtide ſeu veſica* offendatur, (3.) quod fruſta, 20, 21, *vel* 22 libras pondere æquantia occurrant, (4.) quod hæc cyſtis *proximè ad partes piſcis genitales* ſita ſit, (5.) quod Ambra recens exeruta, humida & *perquam penetrantis, adverſi tamen vel tetri odoris* ſit, denique, (6.) quod has ſuas relationes, novaſque detectiones, *piſcatoribus, & iis, qui capturæ Cetorum incumbunt*, debeant.

(B. Differunt autem in ſequentibus circumſtantiis 1. Ds. Dudley refert, hunc ſaccum vel cyſtidem *quavis extremitate poſſidere canalem* vel ductum, alterum à renibus prodeuntem ductum in parte ſuperiori ſacci, alterum in parte inferiori in & per penem tranſeuntem & exeuntem canalem; e contra D. Boylſton, hanc cyſtidem nec introitum nec exitum habere, ait. 2. Ds. Dudley refert, licet etiam in quibuſdam piſcibus nullam Ambram invenerint, ſemper tamen *liquorem* iſtum, de quo ſub N° 8 mentionem fecimus, adfuiſſe; D. Boylſton verò, hunc ſaccum interdum planè vacuum repertum eſſe, affirmat. 3. Ds. Dudley memorat, ſi in uno piſce Ambram reperiſſent, in duobus contrà ferè nihil ejus extitiſſe; ſed D. Boylſton adducit, quod *inter centum* Cetos

vix

vix unus occurrat, qui aliquid hujus Ambræ poſſideat.

Interim tres hæ differentiæ facilè conciliari poſſunt, ad (1^mam ſcilicet quod attinet, ubi in Relatione D. Boylſtoni occurrit, ſaccum nec introitum nec exitum habere, illud tantum orietur à negligentia illius piſcatoris, qui hæc ipſi retulit, & ſingula non adeo accurate, ut D^n Atkinſij piſcator fecit, obſervavit, quomodo enim ſaccus mox repletus mox vacuus offendi poſſet, ſi nec introitu nec exitu præditus eſſet? ad (2^dam quod ſaccus interdum vacuus repertus fuerit, hoc (*a*) vel tantum de globis, vel (*b*) etiam de liquore intelligi poteſt, interim vero relationi D^ni Dudley planè non adverſatur, dum utrumque naturale eſſe, vel ſic tunc temporis contingere valet; Tandem (3^tia quoque differentia nullam involvit difficultatem, ſed utræque Relationes concordant, quod tantum in quibuſdam, nullatenus verò in omnibus Cetis maſculis putatitia Ambra inveniatur, &, prout conjicio, quivis referens modò numerum certum pro incerto poſuit.

Ad utraſque has relationes, adductas circumſtantias, & *putatitiam novam detectionem originis naturæque Ambræ gryſeæ, quod ea ſcilicet in memoratis Cetis genèretur, vel quod Ambra gryſea productum animale ſit*, paucis regero: rem hanc ſe ita planè non habere, ſed hoc pro Ambra gryſea æſtimatum concrementum *nullatenus veram Ambram*, ſed longe aliud, & diverſum naturale quid eſſe. In totum aſſentior opinioni D^n Prince, id quod & omnes viri judicioſi facient, qui generalem tantummodò conceptum de præcipuis Scientiæ Anatomicæ partibus poſſident, aut tantum ſciunt, ubi & quomodo partes principales in magnis belluis ſitæ

 ſint.

ſint. Opinio hæc exſtat in Relatione Dni Dudley, p. 269, verbis ſequentibus : Reverendus Dn Prince in Boſton, Eccleſiaſtes perquam amatus, meus intimus ac familiaris in urbe vicina, qui præcedentem Relationem à Dn Atkins accipiebat, antedictum ſaccum ſeu cyſtidem, *veſicam urinariam*, inibique detentos globos Ambræ gryſeæ, *certum concretum* eſſe opinatur, quod ex pingui & olida ſubſtantia prædicti, & in hoc ſacco contenti, liquoris formaretur. Ego pro mea parte declaro, quod (1.) Sic dicta cyſtis nihil aliud, quam *veſica urinaria* Ceti, (2.) putatitia Ambra gryſea, quæ in eâ reperitur, nihil aliud, quam *calculus veſicæ*, & (3.) iſte penetranter olens in ſic appellato ſacco contentus liquor, nihil aliud, quam *urina Ceti* ſit. Conſiderentur quæſo mea ſuperius extracta notata, ubi ſub N° 3 exſtat, ſaccum hunc, ſeu veſicam longitudine 3, vel 4 pedes, latitudine 2, vel 3 pedes adæquare, plerumque figuram *veſicæ bubulæ* repræſentare, & ferè formam longi follis, quo fabri ferrarii utuntur, habere, annon hoc eſt deſcriptio veſicæ urinariæ? præcipuè cum ſub N° 4, 5, 6, 7, adhuc reliqua requiſita, & debitus naturalis ſitus prolixè deſcribuntur, quomodo cum pene & renibus connectatur, ſub umbilico ſuper teſticulos ad radicem penis collocatus; porro ſub N° 8, quomodo penetrante & graviter olente liquore præditus ſit, quem ordinariò, nulla quoque putatitia Ambra præſente, in veſica hac reperirent, an hic liquor quicquam aliud, quam urina Ceti eſt? Et poſitò, ſi Dn Boylſton hoc, quod ex eo ſub lit. (*d*) extraxi, ita intellectum vellet, quod interdum etiam veſica vacua occurrerit (quanquam circa hoc mentem ſuam minus accuratè explicet, ſed

ego

ego potiùs credam, quod per verbum vacuum, non vacuum ab urina, verum tantum à calculis intellexe-erit) tum itidem non planè impoſſibile aut innatu-rale quid eſſet, ſiquidem aliquoties contingere po-tuiſſet, ut Cetus eo tempore necatus ſit, cum brevi antea urinam emiſit, vel naturali modo hunc liquo-rem ejecit. Urina ulterius ſub N° 9, confirmatur, dum ibi aſſeritur, quod idem liquor (nempe Urina) etiam in canali penis ſeu urethra Ceti (uti omnes u-rinæ) reperiatur. Quis denique hinc dubitaret, quod ſic dicti recenter reperti, & pro Ambra gryſea habiti globi non meri calculi veſicæ Ceti ſint? Perpendamus quæſo ea attentius, quæ ſub N° 10, 11, 12, 13, & 14 extraxi, & conſideremus (*a*) quod hi globi ejuſ-dem odoris ſint ac liquor. atque (prout D^n Prince perhibet) de pingui ſubſtantia liquoris, item, quæ D^n Boylſton ſub lit. (*f*) refert, quod pene-trantis & adverſi ſeu offendentis odoris, ſimiliter, globi ex meris diſtinctis corticibus & ſtratis, cepa-rum adinſtar formati ſint, ubi alter alteri ſemper ſu-peraccreſcit, generatur & induratur, itidem, quod facilè ſecundum hunc ſitum decorticentur & in fe-ſtucas dirimantur, quæro: annon hæc omnia, ſint naturales communeſque circumſtantiæ omnium tam veſicæ urinæ, quam fellis, nec non aliorum calcu-lorum ſive lapidum animalium? Et quare proindè ejuſmodi calculus pro Ambra gryſea? Veſica urina-ria pro ſingulari cyſtide? Et urina pro ſingulari li-quore exiſtimari deberet? Res hæc indè ulterius confirmatur, quia ſub N° 14 legitur: Cetorum piſ-catores obſervaſſe, quod *ſolùm adulti* & grandes Ceti Ambram gryſeam (ego vero calculum dico) contineant, ſecundò, quæ ſub lit. (*b*) ex D^n Boyl-

ſton adducuntur, *inter centum ejuſmodi maſculos Cetos vix unum* reperiri, in quo aliquid Ambræ adſit (ego vero puto, qui calculo affectus ſit) ; hæ duæ circumſtantiæ iterum ſunt planè naturales, & tam beſtiis quam hominibus communes 1.) quod ſeniores citius quam juniores calculo infeſtentur, 2.)quod, ſicuti non omnes homines, ſed ex centum eorum vix unus calculo laborat, hoc itidem quoque plane naturale quid in animalibus irrationabilibus eſſe poſſit. Porro etiam id cum aliis lapidibus animalibus concordat, quod non ſemper tantum numero unus, ſed ſæpè quoque 2, 3, 4 imo plures in veſica occurrant, quod à continua in urina agitatione commodè figuram rotundam nanciſci poſſint, quanquam obſervaverim, figuram calculorum, nec non lapidum bezoardicorum ſæpè, & utplurimum à primo ac interiori fruſtulo, cui prima cruſta vel cortex ſeſe apponit, oriri, an ſcilicet fruſtulum ſit rotundum, oblongum vel anguloſum ; alio tempore figura calculorum ſit à majori aut minori ſpatio & motu : Nam ſi numero ſunt plures, ut veſicæ ſpatium occupent, vel non ſatis liberè circumnatare, ſe ſeque movere poſſint, tum rarò verè rotundi evenient, ſed plerumque inæquales & informes apparebunt ; ſic quoque facilè in feſtucas dehiſcere queunt, ſi plures præſentes ſunt, & à motu animalis una aut altera colliſio horum lapidum in veſica contingit. Denique nec hæc circumſtantia dubium me reddit, dum referunt, *maſculos tantum Cetos* hos continere globos, quoniam eſſe poteſt, ut in hac animalium ſpecie ſive ſoli maſculi illo morbo aut calculo laborent, ſive, quia de fœmellis Cetis, circa hanc rem, nondum ſufficiens experientia adeſt, idque tantò

magis

magis (1. dum ad N° 15 *ferè impoſſibile eſt, fœmellas, ſeu vaccas aſſequi*, & conſequenter longè pauciores Ceti fœmellæ, imo fortè *raro quædam* earum capiuntur, & (2. quia inter ipſos maſculi generis piſces, ſecundum ante adductam Dⁿ Boylſtoni Obſervationem, *è numero centenario vix unus* reperitur, qui hoc calculo laboret.

Ex adverſo illa ipſa, ab utriſque Dominis referentibus prolata circumſtantia, dum eorum Ambra gryſea, quæ mihi calculus Ceti eſt, *non* etiam *in omnibus maſculis Cetis*, ſed vix in uno horum ex centum, adhæc *tantum in ſenioribus* & ætate grandioribus reperitur, tanto magis ad propriam ipſorum contradictionem inſervit, quod *non* ſit *ejuſmodi recrementum, quale Moſchus, Caſtoreum*, &c. eſt, ſimul verò ad eò majorem mei confirmationem, quod nihil aliud ſit, *quam calculus*: ſi enim

(1.) Eſſet *Recrementum naturæ*, vel putatitia ipſorum Ambra gryſea, iſti in veſica reperti adversè olentes globi, Cetis maſculis ejuſmodi innatum quid, & veſica illa, cyſtis ſingularis extra veſicam urinariam, & concretum iſtud, quod in ea reperitur, ſimiliter tale aliquid naturale, prout eſt Moſchus in animali moſchifero, Zibethum in Cato Zibethino, & Caſtoreum in caſtore, quippe quibus Ds. Dudley hunc ex ſtatu morboſo generatum calculum aſſimilare contendit, tum *concretum hoc revera etiam in omnibus iis maſculis Cetis, qui Sperma Ceti ſuppeditant, ſicut Caſtoreum in omnibus caſtoribus, & Moſchus in omnibus capris moſchiferis*, &c. *adeſſe deberet*, nec tum in veſica urinaria occurreret, & *abſolutè omnes* (non vero unus ex centum,

tum, vel tantum ſeniores) ejuſmodi Ceti globos tales *ſemper & inevitabiliter haberent.*

(2.) Si concretum illud his piſcibus eſſet innatum & naturale in ſtatu ſano, ut Caſtoreum, Moſchus, Zibethum & ſimilia, tum non tantum ij Ceti, qui in America Sperma Ceti largiuntur, *ſed & illi* id poſſidere deberent, *qui in Europa* in mari Hiſpanico, Gallico & Britannico, præcipuè in Oceano Septentrionali capiuntur, verùm nemo in his regionibus quicquam ejus vidit, quanquam de veſica urinaria eorum, de urina ipſa, vel quid *in ſtatu morboſo in veſica Ceti appareat*, nullus fortaſsè ſollicitus fuit.

(3.) Dns Dudley in ſua Relatione ait: Maximum Ambræ globum, quem unquam viderit, ponderaſſe 21 *ad* 22 *libras*, qui pro deſcripta magnitudine veſicæ urinariæ jam *magnus ſatis calculus* eſt, ſed jam quæro: undenam tanta Ambræ gryſeæ fruſta prodierunt, quæ planè non rotunda nec certæ figuræ fuerunt, ſimul verò ad 6 pedes magnitudine, & *ad* 182 *libras* gravitate aſcenderunt, vel adhuc plus ponderaverunt, quæque non rotunda, nec ceparum adinſtar corticata, cruſtata, leviter friabilia, nec coloris Aurantij, multò minus adverſi aut ingrati odoris, minimè verò fœtoris, ſed planè informia, firmiter compacta, coloris gryſei, ſubaquili, albicantis, & ſuaviter olentia fuere? Quæro inquam; *undè hæc fruſta proveniunt, quæ pondus & magnitudinem fruſtorum ab illis dictorum decies, vicies & magis ſuperant*, quorum nec maxima optimè adultorum & grandium Cetorum deſcripta cyſtis nunquam ſatis capax eſt, nec unquam capere poteſt?

(4.) Ulterius

(4.) Ulterius quæro : quò modò hæc Ambra gryſea an oras littoris, vel ad terram appellere poſſet? Ex vivis, impoſſibile eſt ut provenerit, quia cyſtis tantùm exitum ſuum per penem habet, & profectò *parvula fruſta* tranſgrederentur, ſi per hunc canalem exire deberent, *quomodò autem tanta Ambræ fruſta perreperent*, quanta haud rarò reperta fuerunt? Si quis verò obtendere vellet: fruſta talia ex Cetis demortuis provenire, facilè regerere poſſem, qua ratione tum ex veſica egrederentur? Præcipuè cum ejuſmodi veſicæ membranoſæ & ſatis tenacis texturæ ſint, ita ut vix, ſecundum rationem, aliquis ſuſpicari queat, quod veſica poſt mortem tam facilè diſrumpere, vel his liberè circumnatantibus globis exitum concedere poſſit; ut ego opinor, Ambra nonnunquam cum ipſa cyſtide circumnatans reperiretur, ſi non multoties, tamen aliquoties, quale quid vero à nemine unquam nec auditum, nec viſum, nec experientia compertum eſt.

(5.) Quomodo roſtra avium, ungulæ, conchæ, ſpinæ piſcium, & alia peregrina, quæ interdum in Ambra gryſea reperiuntur, per renes & ureteres in veſicam urinariam, vel potius in putatitiam Ambræ cyſtidem tranſire & pervenire poſſent?

(6.) Denique, ut ulteriora argumenta contraria præteream, unicum tantum adhuc in medium adducam, quod verò ceu *argumentum primarium*, & tanquam inconvincibile meum ac indiſputabile *principium regulativum chymico-phyſicum* in omnibus rebus naturalibus, & ſic etiam in Ambra gryſea, utpote materiâ quæſtionis, tanquam ultimus judex conſiderari debet, quod me nunquam huc uſque fefellit, nec revera fallere poteſt, ſi modo cum conſideratione,

ſideratione, judicio, circumſpectione, & grano ſatis ſub decenti ordine adhibetur, quodque ſolum me movit, ut in hiſce pagellis proponerem, Ambram gryſeam minimè productum vel eductum animale eſſe, quinimo, quod *unicè ac ſolum ſatis ſufficiens* eſt, licet etiam nihil de adductis hactenus opinionibus dixiſſem, vel id quod dixi, tanquam ſuperfluum conſideretur, *de hac re ſententiam ferendi*, & ad minimum veritatem, quod Ambra *non ſit animale*, declarandi.

Notum eſt, vel quivis, qui hæc adhuc ignorat, aut fortè in dubium vocare auderet, ipſe probare poteſt, quod non tantum Caſtoreum, Moſchus & Zibethum, ſed *omnia quoque animalia eorumque partes*, appellentur quoquo modo velint, quinimo quicquid etiam ſint, in Analyſi chymica ſe ut animalia exhibere debeant, ſive ſint animalia integra, ſive eorum partes, fera aut domeſtica, aves vel piſces, vermes vel alia inſecta, ſive ſit animale alimentoſum, ſive medicamentoſum, ſive planè venenoſum, degat ſuper terram, in aëre, in aqua, ſubter terram, in mari vel in lacu, in ædibus vel in deſerto, in Europa vel America, vel ubi ubi velit, partes quoque ſint ſive ſiccæ & ſolidæ, ſive viſcoſæ, pingues, aquoſæ, friabiles, tenaces, leves, graves, vel aliæ, prout velint, ac quicquid eorum in mundo excogitari poteſt, uno verbo! Quod ſi quippiam eſt animale, tum etiam *in proba chymica, præcipuè aperto igne ſeu deſtillatione per ſe tanquam animale ſe exſerat & demonſtret, oportet*; adeoque vel *Spiritum empyreumatico-urinoſum*, vel ejuſmodi phlegma, vel *oleum animale fœtidum*, aut cum eo adhuc *Sal volatile urinoſum*, eaque omnia ſi non ſimul, tamen

tamen 1, vel 2 partes, aut ad minimum ſaltem veſtigium liquoris urinoſi vel olei animalis empyreumatici largiatur neceſſe eſt; adhuc ſemel conſideratè dico: *Animalia neceſſariò horum aliquid oſtendere ac in aſpectum proferre debent*, quod odorem & guſtum afficiat, quando ea per ignem tractantur, prout quoque omnia animalia id revera largiuntur, quin & ipſa lapidea, terreaque Oſtracodermata hac in proba animalem ſuam proſapiam negare nequeunt. Et ſic quoque *putatitii Ambræ globi*, calculos veſicæ Ceti puto, apertè & ſatis ſufficienter per hanc probam *demonſtrabunt*, quod non tantum purè animalis, ſed & *purè urinoſæ proſapiæ, nempè ex urina Ceti generati ſint.* Si quis è contra veram ab omnibus viſibilibus animalibus partibus *depuratam, nec ab animali quodam olim deglutitam, ſed optimè puram Ambram gryſeam* recipit, & *deſtillationem aperto igne* eodem modo tractat, eaque quæ prodierunt, examinat, ille ne minimum quidem urinoſi, nec *olei animalis* empyreumatici, nec quicquam animale, ſed *planè diverſa & aliter modificata producta, alium liquorem, aliud oleum*, & *aliquid de Sale alio* reperiet, prout id poſteà ulterius adducturus ac demonſtraturus ſum.

Hoc ergo tanquam infallibile ſignum & indubia veritas ſuſcipi poteſt: Simulac in chymica tractatione Ambræ gryſeæ, vel minimum ſubſtantiæ animalis, ſive ſit animale oleoſum, vel urinoſo-ſalinum aliquid, apparet, aut impetratur, quod hoc *nullatenus ab Ambra, tanquam pura Ambra proveniat, ſed ab alia quadam, hoc vel illo modo accidentaliter adveniente vel immixta animali re, quippe quæ ſemper tanquam alienum quid, impurum &*

ad mixtionem Ambræ gryſeæ non pertinens, conſiderari debet; ſive ergo ſit, quod operatio ſuſcepta fuerit cum Ambra olim deglutita, ſive etiam cum non deglutita, in qua tamen roſtra avium vel aliæ parvæ animales partes immixta fuerunt.

Quod autem ejuſmodi à piſcibus vel aliis animalibus *deglutita* Ambra gryſea non quodammodo aliquam alterationem, ad minimum aliqualem maculationem & *animalem inquinationem* perpeſſa fuerit, vix quiſquam negare poterit, ſivè ea poſtea vomendo vel laxando rurſus ejecta, vel in mortuis piſcibus reperta & exemta fuerit; ſufficit! Quod aliquo modo à ſuccis animalibus & devoratis cibis *conſpurcata*, vel planè cum comeſtis piſcibus aliiſque putreſcentibus, & ferè ſtercus factis cibis digeſta, ad minimum infecta, ac coinquinata, per conſequens potius deteriorata, quam meliorata ſit; unde plerumque multò ingratius olet, quin & nigricantior eſſe reperitur, imo experientia ipſos etiam incolas docuit, ejuſmodi deglutitam antea Ambram ſtatim ſolo externo aſpectu cognoſcere, qualem propterea conſequenter quibuſdam in locis, ut ſuperius jam dixi, ſtercus vel excrementum Balænæ appellare ſoliti ſunt.

Et cum utræque ex America tranſmiſſæ ſæpè memoratæ Relationes in totum proveniant principaliter ab ejuſmodi perſonis, *quæ circa mercaturam & capturam Cetorum verſantur, propriè à piſcatoribus, captatoribuſque Cetorum*, imo ex parte inde *ortæ ſint, quod quis audiverit, alterum dixiſſe*; hinc tanto minus ad hoc, tanquam aliquid indubitato certum aut novum de vera origine & Eſſentia Ambræ gryſeæ attendendum erit.

Derelinquo

Derelinquo igitur etiam hanc opinionem, meque jam ad ultimam diſpartitionem ſeu claſſem, ad eos nempè converto, qui Ambram gryſeam pro minerali aliquo habent, vel ejus originem *in Regno minerali* fundant.

In quinque opiniones illi diſpeſci, & ſi opus eſſet, unaquæque earum, in certo ſenſu ſumta, approbari poſſet; verum cum generales expreſſiones in hiſtoria naturali, Chymia phyſica, variiſque aliis ſcientiis, modò occaſionem ad confuſionem, & intellectum amphibolicum ſuppeditent, hinc ſemper melius eſt, ut circa quamvis materiam, quantum equidem fieri poteſt, *Specialiſſimum potius & maxime characteriſticum* adhibeatur, ſicque mens noſtra explicetur.

1. Hugo de Lindſchott, Ambram gryſeam *Terram eſſe* perhibet *, quod ſi hoc in ſenſu latiori intelligeret, & ad prima originalia principia phyſica recurrerent, tum hæc opinio locum retinere poſſet; cum verò per hanc non ſufficienter ſeſe explicaverit, multò minus plus quam *ſimplicem* terream Ambræ mixtionem declaraverit, & credibile ſit, Lindſchottum denominationem illam non in ejuſmodi ſenſu phyſico poſuiſſe, ſed ſimpliciter Ambram pro *merè terrea ſubſtantia* habuiſſe, hinc non poſſum non, hanc denominationem & opinionem pro erronea, contraque naturam, experientiam & proprietatis Ambræ gryſeæ pugnante, declarare, ſicuti etiam cuivis facilè notum eſt, *Terram non tam facilè flammam concipere, nec adeo promptè liquari, ne-*

* Vid. Klobii Ambræ Hiſtoria, p. 19.

que ſolutionem cum ſpiritu vini admittere, ut alias plures Ambræ gryſeæ proprietates jam præteream.

2. Alii quodammodo ad proprietates *liquationis & inflammabilitatis* Ambræ animum adverterunt, ut e. gr. Crato *, aliique plures, hi propterea Ambram *pro Sulphure nativo & vero* reputarunt; Dr Salmon Londinenſis, ait: eſſe Sulphur marinum †. Hæc denominatio jam equidem excuſari poſſet, vocabulum *Sulphur* tropicè vel Synechdochicè, & in tantum intelligeretur aut innueretur, in quantum Ambra gryſea de principio inflammabili ſeu ſulphureo participat, ſiquidem etiam non modò veteres, ſed & adhuc hodiè permulti, omne id quod flammam concipit, Sulphur denominant, ſive ſit minerale, vegetabile, vel animale, oleum, pinguedo, reſina, cera, pix, balſamus, lignum, axungia, carbones, bitumen, ſpiritus vini, vel quicquid aliud; verum cum & hæc generalis denominatio *nihil ſpecifici* exprimat, ſed tantum occaſionem ſubminiſtret ad diverſos conceptus, ſimul quoque clarè ſatis pateat. quod illi ipſi, qui Ambram pro Sulphure nativo & vero judicarunt, nullo modo ad principium inflammabile in utriſque reſpexerint, ſed quod Ambram pro *communi* naturali, perfecto & *vero ſulphure* habuerint, aliàs non verbis expreſſis Sulphur nativum & *verum*, ſed fortè tantum corpus ſulphureum, materiam ſive ſubſtantiam Sulphuream appellaſſent, cum autem notorie ſit, Ambram gryſeam *planè non eſſe Sulphur verum*, inde & hæc opinio nonniſi pro falſa & er-

* In Conſiliis à Laur. Scholtzio collect. column. 1093.
† Vide *London Diſpenſatory*, pag. 398. Edit. Lond. 1696. 8vo.

ronea

ronea haberi poteſt, (1.) Ambra gryſea carbonibus candentibus inſpergatur, *odor* in examine probetur, an cum odore Sulphuris conveniat? (2.) tentetur Ambra gryſea cum Sale alcali fixo, an *hepar Sulphuris*, *Tartarum vitriolatum* & plura ejuſmodi ſuppeditet? (3.) An Ambra Regulum Antimonii rurſus in *Antimonium crudum* reducat? (4.) An ex Ambra in aqua calcis vivæ, vel lixivio alcalino ſoluta, fiat *Lac Sulphuris?* (5.) An ex Ambra & Mercurio *cinnabaris* prodeat, aliaque præparata plura, quæ alias cum Sulphure vero conficiuntur, cum Ambra gryſea quoque parari poſſint? Omnia hæc fruſtranea erunt, cunctæque eò tendentes probæ ſupervacuæ evadent, prout & Libavius Cratoni hac in re jam contradixit.

Tandem quidam rei ipſi propius accedunt, ita ut plurimi Ambram gryſeam non tantum *pro Minerali*, ſed etiam pro eo, quale revera eſt, ſcilicet pro BITUMINE ſeu ſpecie quadam bituminis æſtimaverint, & adhuc æſtiment; ſed in certis circumſtantiis nondum omnes unam eandemque ſententiam fovere poſſent, nam

3. Quidam aiunt, Ambram provenire *in forma liquida.*

4. Alii vero *in forma ſicca.*

5. Adhuc alii, eam in forma viſcoſa, ſive conſiſtentiæ mediæ, in mare prodire aſſerunt.

Differunt etiam in his, (*a*) quod quidam affirment: Ambram gryſeam *ex littoribus* ſub terra prodire & in mare devolvi, (*b*) alii vero ſatagunt evincere, quod *ex abyſſo*, ſeu potius ſub terra fundi maris prodeat in mare.

1.) Illi,

1.) Illi, qui autumant, Ambram gryſeam in principio fuiſſe fluidam, vel qui, eam *in forma liquida* in mare devenire, exiſtimant, perhibent, Ambram in principio naturâ ſuâ eſſe *Bitumen liquidum*, vel *Speciem Naphthæ*, & inter hos recenſeri volunt Ebnſina, Simeon Sethi, Nævius, Avicenna, Agricola, Solenander, Bertinus, Libavius, Garcias ab Horto, Hadrianus Toll, Joh. Euſebius Nierenbergius, Franciſcus Hernandez, & diverſi alii plures, qui omnes ſtatuunt: *Ambram ex manatione fontis bituminoſi ſeu fontis Naphthæ in mare devenire*, & differunt tantum in quibuſdam parvis, *caput rei non attingentibus* circumſtantiis, e. gr. Avicenna & Pſellus volunt, quod *ex Scaturiginibus lateralibus* cum aquis ſimul in mare profluat; alii contra, inter quos etiam Nicolaus Chevalier, qui Anno 1700 magnum illud Amſtelodamenſe fruſtum Ambræ deſcripſit *, accenſendus eſt, referunt, quod per ſe *ex fundo maris* ſcaturiat, & ex Hydrophylaciis Kircherianis ad igne centrali quaſi in mare deſtilletur.

2.) Alii, qui opinionem fovent, quod Ambra *in forma ſicca* deveniat in mare, aiunt, eam eſſe Succinum quoddam, ſeu revera *ſiccum Bitumen*, quod eâdem quoque ratione in mare feratur, ut aliud ordinarium Succinum, ſeu Ambra citrina. Andreas Cæſalpinus eam quidem appellat Gemmam, interim vero collocat ſub ſpecies Succini. Supra citatus Dn Oelven, qui Ambram gryſeam pro Meteoro venditavit, in ſuo Tractatu nihilominus certo loco ait †: Succinum magnam poſſidere affinitatem cum

* Deſcription de la Piece d' Ambre griſe pag. 54, &c.

† Der Monathlichen curieuſen Natur-Kunſt-Staats-und-Sitten-Præſenten, Zweytes Stuck im Februar. 1708 pag. 56.

Ambra

Ambra gryſea, hoc tamen ſubeſſe diſcrimen, quod Ambra gryſea in calidis regionibus, in quibus omnes flores & aromata ſummam ſui generis perfectionem & fragrantiſſimum odorem nanciſcerentur; Ambra citrina e contra tantum in rigidis Septentrionalibus regionibus, & longe frigidiori Mari Baltico, reperiatur: proinde quoque hæc multò craſſioris atque durioris ſubſtantiæ ſit. Denique experientiſſimus pariter ac eruditiſſimus Dr Henckelius * ait; Ambram gryſeam, Succinum & Aſphaltum, ſeu Succinum Orientale, Succinum vulgare, & Succinum nigrum planè non in principiis eſſentialibus, ſed tantum *in quibuſdam accidentalibus & gradibus* inter ſe differre, quæ ultima ſententia inprimis cum experientia quoque convenit.

3) Illi denique, qui Ambram gryſeam *in forma viſcoſa conſiſtentiæ mediæ*, adeoque non penitus liquidâ, nec planè ſiccâ, ſed mediâ, & quidem *viſcosâ* formâ conſiſtentiâque in mare devenire putant, dicunt, quod ea primum tanquam mollis pix, vel ad ſimilitudinem bolbiti in vel ſuper fundo maris reperiatur, ac ſenſim ſenſimque indureſcat. Helbigius idcirco aſſerit: Ambra nec eſt Gummi, nec Reſina, neque ſtercus avium, neque placenta apium, ſed verus in fundo maris, picis adinſtar jacens *Viſcus*, & quaſi ut pix marina creſcens, id quod mercator quidam ex Batavia, qui oculis ſuis illud aſpexiſſet, ipſi hoc modo ſcripſiſſet †. Supra memoratus celebris Rumpffius in literis ad Ten Rhyne datis, hoc certum eſt, inquit, nec aliud quicquam novi, quam veterem meam opinionem de origine

* Vide Bethesda portuoſa, pag. 74.
† Ephem. Nat. Cur. Decur. 1. Ann. IX. ex X. pag. 459.

Ambræ

Ambræ gryſeæ proferre, nempè quod ſit pinguedo quædam, ex fundo maris proveniens, in principio quidem mollis & viſcida, quæ poſteà verò à ſalſedine maris indureſcat *. Aldrovandus, poſtquam varias opiniones adduxit, his demum concludit verbis: Sed has diſtinctiones nullius eſſe valoris judicamus, quandoquidem non piſcium vel Cetorum excrementum, ſed *Bituminis* genus eſſe aſſeruimus †.

Borellus ‖ equidem objectionem quandam adhuc formare conatur, quod Ambra gryſea non ſit Bitumen, obtendens: Bitumina *fœtere*, & *ad internum uſum ineptæ* eſſe; verum in ejuſmodi caſibus non ſemper à genere ad ſpecies, vel à ſpecie ad genus concludere poſſumus, prout & vel ſolum Succinum vulgare contrarium, aut quod Borelli objectio de Ambra inſufficiens ſit, demonſtrat, hoc nempe Succinum hodiè ab omnibus hominibus pro bitumine agnoſcitur, attamen verò *nullo modo fœtet*, ſed *copiosè ſatis & ſecurè* pro uſu interno adhibetur, ut taceam, quæ adducuntur in Actis Eruditor. Lipſienſ. An. 1684, de quadam in Polonia exiſtente Scaturigine ſeu fonte, qui bitumen liquidum *ſvaveolens medicamentoſum* & alimentoſum largitur, odoremque *fragrantiſſimum* & balſamicum poſſidet; nec pluribus attingam oleum montis Zibini Franciſci Arioſti, de quo Oligerus Jacobæus mentionem facit.

Nicolaus Monardes jam dixit ** ; circa originem Ambræ variæ circumferuntur opiniones, ſed *veriſſima* hæc eſt, quod ea ſit *genus bituminis*, & quidem ex

* Valentini Ooſt-Indiſche ſend-ſchreiben, pag. 50.
† Muſ. Metallic. Lib. III. pag. 432.
‖ Loco citat. Obſervationum,
** De Simpl. Medicam, pag. 12.

fonte

fonte manans, quod, ſimul ac aerem ſentit, ſtatim indureſcit, eôdem modô, uti permulta alia ſub aqua maris exiſtentia concreta, ut corallia, &c. etiam mollia ſunt.

Joh. Faber Lyncæus, hoc igitur certiſſimum eſt, inquit, Ambram non eſſe aliud, quam *Bitumen* *.

Ut dicta in ſummam contraham, plerique Scriptores rerum naturalium non tantum in hoc conveniunt 1.) quod, dum de Bituminibus agunt, aſſerant, dari bitumina tam liquida quam concerta, 2.) omnia bitumina ad mineralia referenda eſſe, 3.) quod Bitumen ſiccum nihil aliud, quam pinguedo terræ tenax, facileque urens, & 4.) Ambra gryſea iiſdem proprietatibus dotata, conſequenter abſque ulla contradictione non ſolum *minerale*, ſed in ſuo etiam genere & ſpecie Bitumen ſit.

Quamvis igitur, ratione *conſiſtentiæ originalis*, dum alter Ambram ſub forma ſolida, alter ſub forma viſcida & tenaci, tertius ſub forma planè liquida in mare devenire affirmat, adhuc nonnulla addi poſſint, attamen hoc apprimè neceſſarium eſſe, minimè video, ſiquidem *tres hæ opiniones, tanquam primariæ ex omnibus hactenus adductis*, facilè uniri, atque ita inter ſe combinari queunt, ut certo reſpectu omnes tres rectè ſentiant.

1. Nemo fortè hominum, qui ſolidi quippiam, de origine multorum ſubterraneorum intelligit, negabit, quod omnia Bitumina in principio fuerint *liquida*, licet etiam in forma liquida non in mare devenerint.

* Joh. Fab. Lyncæi Expoſit. in Rech. pag. 565.

2. Neceſſum eſt, ut tam Ambra gryſea, quam Ambra citrina in principio, *ſi non planè liquida*, neceſſariò tamen, per aliquod tempus, in forma *viſcoſa*, vel Ambra gryſea etiam, dum è mari ad littus ejicitur, ſaltem adhuc ejuſmodi texturæ fuerit, ut ſi fortè in mari jam indurata fuiſſet, à ſole facilè emolliri potuerit, alias enim nec roſtella avium, conchæ, teſtæ, earum particulæ, nec aliæ quiſquiliæ ei inhærere poſſent, prout tamen varia ejuſmodi in Ambra gryſea, & ſic quoque, uti ſatis conſtat, tam multivaria inſecta, aliæque res in Ambra citrina, reipsâ inveniuntur.

3. Quod verò demum Ambra gryſea plane *arida*, vel *in forma ſicca*, quamvis tanquam impurum & quodammodo mollius Succinum, interim tamen ut verum *Bitumen* appareat, hoc unicuique ſatis evidens ac præſtò eſt.

De hac materia notatu digna ſunt verba Franciſci Hernandez, inquientis: Ambra gryſea ex quibuſdam fontibus Naphthæ in mare provenit, & procelloſa tempeſtate à vento ac fluctibus ad oras littoris ejicitur, eſt ſubſtantia *odoratiſſima inflammabilis* ſeu ardens, *nunc durior, nunc mollior, nunc friabilis, nunc flexilis*, ita ut quodammodo inter digitos & dentes, inſtar ceræ flecti vel extendi queat, &c.

Ego proinde, quantum perſpicere poſſum, credo & cenſeo.

(1.) Ambram gryſeam identidem, prout Ambra citrina, ex terra in mare devenire.

(2.) Eam non ſicut Naphtha vel Petroleum, ſed jam ſub craſſiori, flexili, & probabiliter ſæpè adhuc viſcida & tenaci conſiſtentia in mare provenire.

(3.) Quod

(3.) Quod ſub prima concretione vel formatione Ambræ gryſeæ bitumen liquidum vel Species Naphthæ concurrat, & mixtione ſimul conſtituat.

(4.) Quod magna fruſta ſimul quidem generari poſſint, utplurimum tamen in principio tantum paucum quiddam ſimul oriatur, cui fruſtulo rurſus novum quoddam veluti ſtratum ſuperaccreſcat, vel ſeſe apponat, adeoque hoc modo per plura & recentiora ſemper ſtrata Ambra gryſea nunc in rotunditate, nunc in longitudine, vel etiam in planè inæquali forma augeatur & increſcat, ſub qua formatione ſemper adhuc aliquantum mollis ſit, unde variæ res ei agglutinari poſſunt, interim de tempore ad tempus ſenſim ſenſimque magis induretur, circiter uſque ad conſiſtentiam ceræ.

Et cum pleraque Ambra gryſea ita *ſub forma ſtratorum vel corticum* appareat, hinc fortè hæc circumſtantia eos, qui in America degunt, ſeduxit, ut ſibi imaginarentur, quod eodem modo, ut lapis Bezoardicus, vel calculus generetur, cum tamen conſiderare potuiſſent, diverſa alia corpora ſubterranea plura, tam bituminoſa, ut carbones foſſiles, mineræ aluminoſæ, &c. quam etiam alia mineralia, ut Talcum, Ardeſia, Glacies Mariæ, &c. *eâdem ſub figurâ*, ac calculi animales, *per ſtrata* oriri.

Cæterùm nequidem adeo neceſſarium exiſtimo, primam originem Ambræ gryſeæ tam profundè rimari, vel *primordialem ejus generationem* tam accuratè velle perſcrutari. Quis enim indubitatè certò explicare poteſt, qua ratione viliùs illud & in majori quantitate occurrens vulgare Succinum oriatur? Quomodo metalla, ſemimetalla, gemmæ, fluores, atque innumera alia concreta mineralia generentur? de pau-

ciſſimis mixtis & compoſitis ſubterraneis certum quid novimus, *quo fiant modo*, licet hoc & illud conjiciamus, imo, quamvis de permultis ſcire & experiri poſſimus, *quid ſint*. Ut mihi videtur, relatio iſta vel notitia, quo aut quali modo illæ à Deo ſolo creatæ res factæ ſint, vel quomodo eæ adhuc dum fiant & generentur, nobis non adeò neceſſaria nec utilis eſt, nequaquam enim nos miſeri homines ejuſmodi, ex incomprehenſibili Supremi omnipotentia, orientes creaturas propterea imitari poſſemus; ſed eò plene contenti eſſe poſſumus, ſi modò rectè novimus, *quid ſint hæc naturalia?* nimirum (1.) ex quo naturæ regno iſta, quam ad manus habemus, Dei creatura proveniat, (2.) quidque ea ſit, non tantum nomine tenus, vel ſecundum nudum aſpectum, ſed primariò, *ſecundum internam ipſius mixtionem, affectionem & indolem*, quæ poſterior cognitio ex ſe ipſa priorem manifeſtat, ita ut ſaltem Chymicus ſæpè non opus habeat quærere vel noſſe, an Subjectum, quod ipſi ad manus eſt, vegetabile, vel minerale, vel animale ſit? idque tantò minus, quia alius ipſi fortaſsè planè falſam, atque cum natura & proprietatibus Subjecti nullatenus convenientem reſponſionem vel relationem (ut e. gr. de Ambra gryſea) dare poſſet. Sed Chymicus ea tantum inſtrumentis ſuis examinet, vel conſideratò per Chymiam evolvat, tum ipſi non nudè dubioſa, ſed planè indubia, diſputationum non indigens, irrefutabilis ac vera reſponſio in manus & oculos incurret. Hoc igitur verum fundamentum eſt, cui inniti, & per quod omnes dubias vel penitus erroneas, licet etiam doctè & probabiliter excogitatas, vel ornatiſſimè ac prolixè deſcriptas, impreſſas, aut æri prorſus inciſas præfigurationes & opiniones, ſi

nempè

nempè experientiæ Chymico-phyſicæ, tanquam *ſinceriſſimo & infallibili lapidi lydio mixtorum naturalium* non reſpondeant, oppugnare, iiſque liberè contradicere poſſumus.

Ut finiam, non poſſum non mirari, quod Paulus Hermannus, in materia medica ſatis expertus, ne verbum quidem de Ambra gryſea in Cynoſura ſua adduxerit, licet, eam præteriiſſe, ſatius egerit, quam ſi ridicula talia propoſuiſſet, ut hoc in caſu Leonhard Fuchſius * fecit, quippe qui, nullam in orbe *Ambram* nativam dari, ſed *omnem factitiam* eſſe, judicavit ; Sepultam vero mittamus ſimpliciſſimam hanc opinionem cum ſuo inventore, & contra ulterius conſideremus, unde Ambra apportetur, & qua ratione ordinariò ſe in commercio viſui noſtro exponat?

Ambra gryſea maxima ex parte apportatur ex India Orientali, ex & circa Inſulam Madagaſcar, ex Inſulis Moluccenſibus Mauritii ad Neykotarres, Inſulis Occidentalibus Sumatræ, Inſula Borneo, & Caep Commoriis ad Malabar, ex littoribus Æthiopicis, quippe quæ à Sofala uſque ad Brana perquam ambrifera eſſe perhibentur. Et ſic aliæ quoque regiones ac loca in mundo reperiuntur, ſiquidem Ambra in mari longè admodum propelli, adeoque centenis in locis, regionibus & ſituationibus littoris maris ejici, [illegible] ſuperius adduximus, offendi [illegible]

[illegible]t, quod precioſum hoc bitu-
[illegible]*is fruſtis ſeu maſſis* repe-
[illegible]ducam, quæ Faber Lyn-
[illegible]ar refert, interdum fruſta

* Further in her poſt Med[illegible]entor. Libr. I. pag. 211.

Ambræ

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Conſideratu dignum eſt, quod precioſum hoc bitumen non raro *in permagnis fruſtis ſeu maſſis* reperiatur. Non quidem adducam, quæ Faber Lyncæus ex Gregorio de Bolivar refert, interdum fruſta

* Fuchſius de Compoſ. Medicamentor. Libr. I. pag. 211.

Ambræ

Ambræ 100,000 libras ponderantia dari, multominus, quæ in Garcia ab Horto exſtant, totas Inſulas Ambra gryſea plenas exiſtere, & in regione iſtarum Inſularum totum maris fundum Ambra præditum eſſe; omnium minimè ad ea animum reflectam, quæ quidam nationc Gallus, nomine Iſaac Vigny, qui per aliquod tempus peregrinatus eſt, refert, ſe Regionem ſcire, quæ adeò dives ſit Ambræ, ut mille naves eâ ſolâ onerari poſſent, de omnibus his, inquam, nimium excedentibus hyperbolis, nihil quicquam adducam, ſiquidem ea non parum fabuloſa, & ultimum mihi magis quam Vaſconicum videatur, ſed ſequentia tantum exempla, tanquam veritates conſiderari, vel ſaltum hoc exinde certum reddi poteſt, quod ingentia utique Ambræ fruſta dentur.

Anno 1555, in Promontorio Comorim fruſtum Ambræ gryſeæ circiter 3000 librarum repertum eſt, quod tum temporis pro Aſphalto ſeu communi Bitumine vendiderunt. Joh. Hugo de Lindſchot ait, circa hoc Promontorium quondam fruſtum 30 Quintalium, ut vocant, id quod circi; ter 150 Centenarios pondere æquat, deprehenſum fuiſſe. Monardes & Franciſcus Hernandez mentionem faciunt de fruſtis 100 librarum. Garcias ab Horto etiam fruſta Ambræ adducit, quæ magnitudinem viri adæquarunt, ulterius fruſtum, quod 90 manus latas in longitudine, & 18 manus latas in latitudine complexum fuit. Montanus memorat de fruſto, quod 130 libras ponderavit, & à Rege in Satſuma Anno 1659, conſervatum fuit. Anno 1666, circa Promontorium viride ad fluvium Gambi, fruſtum 80 librarum ejectum & in Hollandiam aſportatum eſt. Anno 1691, Amſtelodami fuit maſſa 42 librarum. Daniel de Bruel, circa

Malaccam

Malaccam fruſtum 33 librarum repertum fuiſſe, affirmat. Romæ fruſtum, magnitudine caput viri adæquans, eſt. Similiter etiam Romæ & in Loretto, variiſque aliis Italiæ locis permulta precioſa & artificiosè fabrefacta ex Ambra gryſea viſuntur, quæ, hæc ex permagnis fruſtis elaborata eſſe, ſatis ſuperque demonſtrant.

Ante dictus Vigny non parvum fruſtum habuit, ſecumque ex India aſportavit, ſiquidem 1300 libras Sterl. pro eo accepit. Notus adeò Kæmpferus ipſe teſtis eſt, ſuo tempore in Japonenſi Provincia Kinokuni fruſtum Ambræ repertum fuiſſe, quod 100 Catti, ſeu 130 libras Hollandicas pondere ſuperaverit.

Fratres germani Joh. Andreas & Marcus Matſperger Auguſtæ vindelicorum à Roberto Struzzi Venetiis Anno 1613, fruſtum coëmerunt, 48 libras & 8 uncias ponderans.

Et quid opus eſt plura conquirere, recentiſſimum, optimum & maximè convincens exemplum habemus in magno illo fruſto Ambræ gryſeæ, quod Societas Indiæ Orientalis in Hollandia, Anno 1693, à Rege Tidori pro 11,000 thaleris coemit, cui primum forma teſtudinis, ac pondus 182 librarum fuit, & craſſitie 5 pedes & 8 pollices, longitudine vero 2 pedes & 2 pollices adæquavit: Ante memoratus Nicolaus Chevalier prolixè illud in exiguo Tractatu Anno 1700. Amſtelodami impreſſo, deſcripſit, & varias icones æri inciſas, prout hoc fruſtum ab omnibus lateribus apparuerat, addidit. Fruſtum hoc Amſtelodami per multos annos cuſtoditum, & à tot centenis, ſi non aliquot millibus hominum tanquam raritas ſingularis viſitatum, tandem

dem in fruſta confractum & auctionis lege venditum fuit, ita ut permulti eorum, qui adhuc in vivis ſunt, hujus rei oculati teſtes eſſe poſſint, & per conſequens nemo de hac circumſtantia, quod ſatis magna fruſta Ambræ reperiantur, dubitare debeat; hac occaſione ſemel adhuc quæro, qua ratione Americani Domini referentes cum ſua cyſtide hic convenient, ſi de tam ingentibus Ambræ gryſeæ fruſtis auditu vel lectu quicquam percipiunt?

Continuabitur hæc Diſſertatio in N° *ſeq.*

II. *An Account of a* new Engine for raiſing Water, *in which Horſes or other Animals draw without any loſs of Power (which has never yet been practiſed) and how the Strokes of the* Piſtons *may be made of any Length, to prevent the loſs of* Water, *by the too frequent opening of* Valves, *with many other Advantages altogether new; the Model of which was ſhewn to the* Royal Society *on the* 28th *of* November, *by* Walter Churchman, *the Inventor of it.*

The Deſcription *of this* Engine *is given on the Sides of the* Plate, *where the* Engine *itſelf is likewiſe delineated.* Vide TAB.

THE Animals all draw horizontally, and in a ſtreight Line, and at right Angles, whereby they exert their utmoſt Force. — By theſe Advantages

tages a far greater Power is gain'd from the Strength of Horſes, *&c.* than by their going round in a Circle; for by the Twiſt and Acuteneſs of the Angles, they draw in towards the Centre, whereby they waſte their Power, and alſo ſhorten their Levers: Beſides, their Muſcles and Tendons from their hinder Legs all along their Sides to their Necks are unequally ſtrain'd, as the Duty is hardeſt on one Side, even tho' their Walk is large. Therefore each of thoſe Inconveniencies muſt be attended with Pain to the Animals when at Work, and a great Loſs of their Strength.

2*dly*, A Crank does not riſe quite one third of its Circle, neither do the Regulators or Rods riſe or fall perpendicular, but obliquely, by which an oval Figure is made by the Piſton's Motion in every Cylinder, which occaſions great Friction and a loſs of Water, and every Arm of it is continually varying in its Power whilſt working, as its Lever is diſtant from the perpendicular Line, and two of the Arms (ſuppoſing it a quadruple one) as they croſs the Perpendicular are always drawing to, and from their own Centre, by which the Power is not only loſt, but the Time alſo; and farther yet, by the ſhortneſs of the Strokes, all the adjacent Water is frequently contrarily moved, and by the often opening and ſhutting of the Valves, there is alſo a great Waſte of the Water, beſides the many heavy Bearings, Frictions, Surges, and Repairs belonging to it; all which Inconveniencies and Impediments being thoroughly conſidered, there muſt certainly be required a much greater Power to work the ſame than by my Method. For, hereby, a

Stroke of 24 Feet will riſe, and by enlarging or diminiſhing the fix'd Wallower, you obtain a Stroke of any required Height, even to the extent of the Atmoſphere's Preſſure. By this great Advantage, the Water riſes freer, and with greater Velocity, and as the Lifters or Forcers riſe and fall exactly perpendicular, and with an equal continued Strain, and as the Bearings alſo are fewer and lighter, conſequently the Friction in all theſe will be a great deal leſs than with the Crank, &c. And, Laſtly, Seven Eights of that Water which is always loſt by the ſlow opening and ſhutting of the Valves will be ſaved.

From the above Conſiderations, and by the many Experiments I have made on this Occaſion, in order to know the real Difference between theſe different ways of Working, I find, that near twice the Quantity of Water will be raiſed to the ſame Height, in the ſame Time, with the ſame Power, by my Method, more than with the beſt Crank-work that has ever been yet erected.

III. *An*

III. *An Abſtract of the* Meteorological Diaries, *communicated to the* Royal Society, *with Remarks upon them, by* W. Derham, *D. D. Canon of* Windſor, *F. R. S.* [Vide PART III. *in Tranſact.* N° 433.]

PART IV. *Containing Meteorological Obſervations made at*

Naples
Bengal
Chriſtiana } 1727.

AN Abridgment of the *Meteorological Obſervations* made in the Year 1727, at *Naples*, by Dr. *Nic. Cyrillus*, *Prim. Med. Profeſ.* and at *Bengal*, by the Reverend Mr. *Bellamy*, Chaplain to the *Engliſh* Factory; and at *Chriſtiana* in *Norway*, by ——— communicated by Mr. *Pr. Kink.* Extracted, for the Uſe of the *Royal Society*, by *W. Derham, F. R. S.*

I ſhall begin (as in my former Abſtracts) with a ſhort and eaſy View of the *Barometrical* and *Thermometrical Obſervations*, in theſe little Tables of them, which will be the more valuable, on account of the Obſervations being made (as I ſuppoſe) with ſome of the *Societies* Glaſſes, of Mr. *Haukesbee's* Preparation.

The *Barometrical Means* of *Naples* are, both as they are ſet down by the illuſtrious Obſerver

himſelf, according to Dr. *Jurin*'s Directions; and alſo as they are between the higheſt and loweſt Stations of every Month. Thoſe of *Norway*, are in the latter Way.

A TABLE *of the Barometrical Ranges at* Naples, *and at* Chriſtiana *in* Norway, *in the Year* 1727.

	JANUAR.		FEB.		MAR.		APRIL.		MAY.		JUNE.		
	Naples		Naples		Naples		Naples		Naples		Naples		Norw.
High	29.80		29.88		30. 6		29.88		29.88		29.72		29.3
Mean	29.55	29.65	29.63	29.72	29.59	29.73	29.71	29.72	29.71	29.73	29.60	29.64	29.1 ½
Low	29.30		29.38		29.12		29.54		29.54		29.46		29.0

The TABLE *continued.*

	JULY.			AUGUST.			SEPTEMBER.	
	Naples		Norw.	Naples		Norw.	Naples	
High	29. 80		29. 7	29. 80		29. 7	29. 88	
Mean	29. 67	29. 70	29. 3½	29. 55	29. 63	29. 5	29. 59	29. 72
Low	29. 54		29. 0	29. 30		29. 3	29. 30	

	OCTOBER.		NOVEMBER.		DECEMBER.	
	Naples		Naples		Naples	
Higheſt	29. 88		30. 06		29. 88	
Mean	29. 50	29. 66	29. 59	29. 75	29. 59	29. 65
Loweſt	29. 12		29. 12		29. 30	

A TABLE *of the Thermometrical Ranges at* Naples, Bengal, *and* Chriſtiana, *in the Year* 1727.

	JAN.	FEB.	MARCH		APRIL		MAY		JUNE.		
	Nap.	Nap.	Nap.	Beng.	Nap.	Beng.	Nap.	Beng.	Nap.	Beng.	Chriſt.
High	51.3	44.5	48.3	15.2	41.0	15.3	30.0	20.4	20 0	10.8	46
Mean	47.1	40.0	41 0	7.6	31.0	7.9	24.0	10.6	14.7	5.8	37
Low	43.0	35.0	34.5	0.1	21.0	0.6	18.0	0.7	9.5	0.8	29

	JULY			AUGUST			SEPT.		Oct.	Nov.	DEC.
	Nap.	Beng.	Chriſt.	Nap.	Beng.	Chriſt.	Nap.	Beng	Nap.	Nap.	Nap.
High	17.0	15.4	40	21.0	15.4	45	25.0	10.4	43.5	47.0	50.5
Mean	10.0	7.7	35	11.1	7.8	35	19.7	7.7	32.2	43.7	43.2
Low	3.0	0.1	30	7.3	0.2	25	14.5	5.0	21.0	40.5	36.0

Theſe

Theſe Tables give an eaſy View of the *Barometer* and *Thermometer* in the ſeveral diſtant Parts of the World ſpecified: which would have been very inſtructive, had they been obſerved throughout the Year, as they were at *Naples*.

By the *Barometrical* Obſervations it appears, that the Aſcent and Deſcent of the Quickſilver is not ſo great at *Naples* as in the more Northerly Climes: For it was but twice in the whole Year, above 30 Inches; and but thrice as low as 29.12 Inches. And ſo in *Philoſ. Tranſact.* N° 321. I obſerved, that, at *Zurich* the Range is but about an Inch; but at *Upminſter* I find the higheſt Aſcent to have been 30.44 Inches; and the loweſt Deſcent 27.44 Inches, which is a Range of 2½ Inches: And by my Account of the *Petersburgh* Obſervations in 1724, it appears that the Mercurial Range there is 3.31 Inches, in *Philoſ. Tranſact.* N° 424. *p.* 107. And as for *Norway*, the Obſervations are too few, and all made only in the Summer Months, whereby no good Judgment could be made: And *Bengal* had no *Barometer*.

By the *Thermometrical Table* we may judge of the Heat and Cold of the ſeveral Places. For the right underſtanding of which, I muſt repeat what I ſaid in a former Abridgment, *viz.* That in Mr. *Haukesbee*'s Thermometers, the Point of *Extream Heat* is 5 Degrees above 0; that 45 Degrees below 0, is the Point of *Temperate*; and 65 Degrees, the Point of *Freezing*. But Dr. *Cyril* (*vide Phil. Tranſact.* N° 429. *p.* 336.) ſaith it freezes with them at *Naples* when the Spirits are only got to 55 Degrees. His Words deſerve Conſideration: *Illud veſtrûm preſpicaciâ, & inveſtigandarum naturalium rerum ſtudio dignum reputo, quâ de re fiat, ut*

apud

apud nos Aqua congeleſcat, Thermometri liquore vix ad gr. 55 depreſſo, quum Londini id non accidat niſi ad gr. 65, quo loco veſtrum Froſt *eſt notatum. Si quid valet Philoſophari, ad Aquæ in Gelu concretionem, præter intenſum Frigoris gradum, aliquid aliud requiritur, quo in noſtris, non in veſtris regionibus Aer ditatus eſt. Quemadmodum ut Aqua in Glaciem arte mutetur, haud nix ſola, ſed ſale miſta admovenda.*

And as at *Naples* it *Freezes* at a warmer Degree of the Thermometer; ſo I obſerve that at *Chriſtiana* the illuſtrious Obſerver complains of the *vehement Heat of the Sun, Æſtus Solis vehemens*, in *July*, when the Spirits were but at 36 Degrees and 34 Degrees; in *Auguſt* at 25, 27, and 28 Degrees, he ſays, the *Weather was exceeding hot, Cœlum calidiſſimum.* I thus diſtinctly mention (as the Author doth) the *Heat of the Sun*, and the *Heat of the Weather*, becauſe they may not mean the ſame Thing, I having been informed by the Whale-Fiſhers, that in *Greenland* the Heat of the Sun is ſcarce tolerable on one Side of the Ship, when on the other Side it Freezes hard.

At *Bengal* the Heat at ſome times ſeems to be very intenſe, by the Thermometer being, in ſome Months, more Degrees about the o, than the Point of *Extreme Heat* is. As particularly in *April, May* and *June*, it was 6, 7, and 8 Degrees above o. But thoſe exceſſive Heats are generally in the Afternoons, the Forenoons being more temperate, and the Temperature, or what they call Cold there, is at the ſame Time of the Day. And the Degree of the Thermometer, at which they reckon it coldiſh, is

about

about 15 Degrees. And on *May* 2d, at 8 o' Clock in the Morning, Mr. *Bellamy* ſaith (the Glaſs being then at 20.4 Degrees) *The Morning was like Winter Weather in Europe.*

Whether this ſo different Judgment of great Cold at *Bengal*, when the Thermometer was about 20 Degrees; and of exceſſive Heat at *Chriſtiana*, when it was but a little below that, *viz.* at 25 Degrees, *&c.* Whether, I ſay, this difference of Judgment ariſes from ſome Prejudice of the Senſes, or from ſome extraordinary Quality in the Air, I leave (as Dr. *Cyril* doth) to the Judgment of the learned Society.

As to the Weather, Winds, Rain, *&c.* of the ſeveral Places, it would be endleſs to meddle with Particulars, and therefore a tranſient View of every Month muſt ſuffice.

At *Naples*, *January* was a cool Month, frequent Rain, with much Thunder and Storms of Wind. The Rain amounted to 111½ Meaſures (23 of which make an *Engliſh* Inch in Depth) which is 4 Inches 19½ Meaſures, or near 5 Inches Depth. *Veſuvius* was pretty quiet.

February was a drier Month, the Rain amounting only to 14 Meaſures, which is but little above half an Inch deep. The Weather was for the moſt part Cloudy, with ſome Froſts. *Veſuvius* emitted a thick Smoak.

At *Naples*, in *March* it was cold, with Hail, and Snow on the Mountains, the Rain amounted to 101 Meaſures, which makes 4 Inches, 9 Meaſures depth. The Winds were in all the Points. *Veſuvius* diſcharged Rivulets of Fire.

At

At *Bengal* the five laſt Days (which were all obſerved in this Month) were Fair, the Wind S.

In *April* the Winds at *Naples* were much in the northerly Points, cold, frequent Thunder, the Rain only 38 Meaſures, which make 1 Inch, 15 Meaſures. No Fire in *Veſuvius* the Beginning of the Month, but towards the latter End, divers Rivers of Fire and Smoak.

At *Bengal* the Wind was much among the ſoutherly Points, Cloudy, ſome Rain and Thunder. The Weather for the moſt part temperate, but great Heats in the Afternoons.

In *May*, at *Naples*, the Wind lay much in the weſterly and ſoutherly Points. Rain 103½ Meaſures, which makes 4 Inches 11½ Meaſures Depth, with frequent Thunder. *Veſuvius* caſt out Rivets of Fire, which reached almoſt to the Bottom of the Mountain.

At *Bengal* the Winds varying, but for the moſt part ſoutherly, with much Cloudy, Rain, and Thunder. The Beginning of the Month colder than ordinary; afterwards exceeding hot.

In *June*, at *Naples*, the Wind was much in the weſterly and north-weſterly Points, but little Rain, only 6½ Meaſures, which is but about a quarter of an Inch depth.

At *Bengal*, much Rain with Thunder and Heat. On *June* 6th, it is noted, *we are now pretty certain the Rains are ſet in.*

At *Chriſtiana*, the Obſervations begin on *June* 22d. The Weather temperate, and for the moſt part cloudy, with Thunder, Hail and Rain.

July,

July, at *Naples*, was a very hot, dry Month, without any Rain, but frequent Mists. *Vesuvius* quiet.

At *Bengal* frequent and much Rain, with Thunder and Lightening; for the most part cloudy. Winds perpetually varying.

At *Christiana*, great Rains with Thunder, frequent Fogs, some Fair, and Complaints of vehement Heat, although the Thermometer was but at 30 Degrees in that Month.

In *August*, at *Naples*, the Wind was in the westerly and north-westerly Points. Showers with Thunder were frequent, which amounted only to 49½ Measures, which is but a little above 2 Inches depth. And although, by the Table, the Weather seems to have been warm, yet there are frequent Complaints of the Air being cold. *Vesuvius* cast forth a large River of Fire.

At *Bengal* much Rain, with Thunder and Cloudy. Winds varying, but pretty much Easterly. Weather sometimes very hot, but for the most Part more Temperate than in some of the other Months.

At *Christiana* the Winds various; frequent Mists, with Cloudy, and sometimes Fair, and sometimes Rain. Great Complaints of Heat, although by the Thermometer no great Signs of it.

In *September*, at *Naples*, the Winds various, and very stormy towards the latter End of the Month, with horrible Thunder, Lightening, and heavy Rain, which amounted to 220½ Measures, making 9 Inches 13½ Measures in depth; which was more than fell in any Month of this Year, and drowned the Marshes, and did a great deal of Damage to

Houſes, Trees, &c. *Veſuvius* was quiet at the Beginning, but fiery at the End.

Bengal, hath only the 7 firſt Days Obſervations where the Wind was moſtly Eaſterly, Cloudy, and Showery, with Thunder and Lightening.

The Obſervations of the remaining Months are all of *Naples*; where, in

October, the Wind was various, and ſometimes ſtormy, with Thunder; frequent Miſts, and ſometimes heavy Rain, amounting to 107 Meaſures, which make 4 Inches 15 Meaſures, and in the Mountains Snow. *Veſuvius* turbulent in the Beginning of the Month, and emitted a River of Fire.

November was, for the moſt Part, a cloudy miſling Month, with Thunder and Rain; but of no greater Quantity than 73 Meaſures, which are equal to 3 Inches 4 Meaſures depth *Engliſh*. The Wind was more Northerly than in any other Quarter. The Fire of *Veſuvius* leſs.

December was a wet, unſeaſonable Month, the Rain being 179 Meaſures, which is 7 Inches 18 Meaſures in depth; which following the Rains and unſeaſonable Weather of the preceeding Months, ſo damaged the Fruits of the Earth, that publick Prayers were ordered for fair Weather.

The Rain of the whole Year the illuſtrious Obſerver computes at 3 *Engliſh* Feet 7 Inches and 14½ Meaſures. And to ſhew how much wetter this Year was than the others, he gives theſe Quantities of the Year 1724, 2 *Engliſh* Feet 10 Inches, 14 Meaſures; of 1725, 2 Feet 10 Inches, 17 Meaſures; of 1726, 1 Foot, 11 Inches, 14½ Meaſures.

IV. *An*

IV. *An Account of the* Dead Bodies *of a* Man *and* Woman, *which were preſerved* 49 *Years in the* Moors *in* Derbyſhire; *being part of a Letter from Dr.* Charles Balguy *of* Peterborough, *to* Cromwell Mortimer, *M. D. R. S. Sec.*

IT is very common to ſee dead Bodies which have been preſerved by Art for many Ages: But that they ſhould lie unchanged by means of the Soil only in which they were Interred, will appear ſtrange to moſt People; nor ſhould I have taken upon me to relate it, had it not happened in the Neighbourhood where I was born; and that I had an Opportunity therefore of informing myſelf well concerning it.

The Perſons of whom you have the following Account were loſt in a great Snow on the *Moors*, in the Pariſh of *Hope*, near the *Woodlands* in *Derbyſhire*, *January* the 14th, 1674; and not being found 'till the 3d of *May* following (the Snow laſting probably the greateſt part of that Time) they then ſmelt ſo ſtrong, that the Coroner ordered them to be buried on the Spot. The Man's Name was *Barber*; he had been a conſiderable Graſier, and was well known by the People that found him: but being reduced in his Circumſtances, was then going off with his Servant-Maid for *Ireland*. They lay in the Peat-Moſs 28 Years 9 Months before they were looked at again, when ſome Countrymen, having obſerved, I ſuppoſe, the extraordinary Quality of this Soil in preſerving dead Bodies from corrupting, were curious enough to open the Ground to ſee if theſe Perſons had been ſo preſerved, and found them

no way altered, the Colour of their Skin being fair and natural, their Flesh soft as that of Persons newly dead. They were afterwards exposed for a Sight 20 Years, though they were much changed in that time, by being so often uncovered; and in the Year 1716, Dr. *Bourn* of *Chesterfield* was there, who gave me this Account of the Condition they were then in, *viz.* The Man perfect, his Beard strong, and about a ¼ of an Inch long, the Hair of his Head short, his Skin hard, and of a Tann'd-leather Colour, pretty much the same as the Liqour and Earth they lay in: He had on a Broad-cloth Coat, which he tried to tear a Skirt off, but could not. The Woman, by some rude People had been taken out of the Ground, to which one may well impute her greater Decay; one Leg was off, the Flesh decayed, the Bone sound, the Flesh of one Hand decayed, the Bone sound; on her Face, the upper Lip, the Tip of her Nose decayed, but no where else. Her Hair was long and springy as that of a living Person. He took out one of the Fore-Teeth, the upper Part of which, as far as was contained in the Socket, was as elastic as a piece of Steel; and, being wrapp'd round his Finger, sprung again to its first Form; but this Power was lost in a few Minutes after it had been in his Pocket.

Mr. *Barber* of *Rotheram*, the Man's Grandson, was at the Expence of a decent Funeral for them at last in *Hope* Church, where upon looking into the Grave some time afterwards, it was found they were entirely consumed.

Mr. *Wermald* the Minister of *Hope* was present when they were removed: He observed that they lay about a Yard deep, the Soil or Moss moist, but

no

no Water ſtood in the Place at all. He ſaw their Stockings drawn off, and the Man's Legs, which had never been uncovered before, were quite fair; the Fleſh, when preſſed with his Finger, pitted a little, and the Joints played freely and without the leaſt Stiffneſs: The other Parts were much decayed: What was left of their Cloaths (for People had cut away the greateſt part to carry Home as a Curioſity) was firm and good; the Woman had on a piece of new Serge, which ſeemed never the worſe.

These are all the Particulars of moment which my Friends, who ſaw them at this diſtance of Time, are able to recollect. The Thing is certainly very remarkable, as there are no Means known (I believe) of preſerving dead Bodies ſo well. I leave People to pleaſe themſelves, by making their own Obſervations upon it; though ſome time or other, when I have Opportunity and Leiſure to furniſh myſelf with the neceſſary Experiments, I may trouble you again on this Subject.

V. *An Account, by Dr.* Richard-Middleton Maſſey, *of a Book, entituled* Locupletiſſimi Reurm Naturalium Theſauri, *accurata Deſcriptio, &c.* Vol. I. Amſtel. 1734. *in* Fol. *An exact Deſcription of the principal Curioſities of Nature, in the large* Muſeum *of* Albertus Seba, *F. R. S. Vol.* I. Amſterdam, 1734.

THIS magnificent Work is to conſiſt of four large Folio Volumes. The ingenious, curious, and moſt diligent Collector, takes in all parts of Natural Hiſtory,

Hiſtory, and gives us Deſcriptions and Figures of things ſcarce ever ſeen or heard of before in *Europe*, which he has collected from all Parts of the World, with vaſt Charge as well as Induſtry.

The Firſt Volume contains 111 Plates, beſides the Author's Effigies, and the Decorations curiouſly Engraven by the beſt Hands. He begins with the Anatomy and Skeletons of ſeveral Fruits, Leaves, and Roots: The Method of performing which, he communicated to the *Royal Society* ſome time ago; 'tis printed in the *Philoſ. Tranſact.* Nº. 416. He then goes on with a Deſcription of ſeveral curious exotic Plants, with a particular Account of the *Zagoe Amboynenſium*, *Morus Papyrifera*, &c. After theſe follow a great Variety of different ſorts of Animals from all parts of the World. *Armadillo's*, *Ai*, or *Sloths*, *Spiders*, *Millepedes*, *Scorpions*, *Flying-Squirrels*, *Opoſſums*, *Mice*, *Rats*, *Cats*, *Dogs*, large *Frogs* and *Toads*. A Deſcription of the *Pipal*, a ſort of *Toad*, whoſe *Young* are produced on the Back of the Female. An Account of the Transformation of *Frogs* from *Fiſhes*, and back again from *Frogs* to *Fiſhes*. Several kinds of ſcarce *Lizards*, *Iguana's*, *Chamæleons*, *Salamanders*, *Tortoiſes*, *Crocodiles*; of which two laſt, ſome are repreſented in the Eggs, and ſome juſt excluded. A *Dragon* or *Baſiliſk* from *America*, with above fifty ſeveral ſorts of *Serpents*.

F I N I S.

Numb. 435.

PHILOSOPHICAL TRANSACTIONS

For the Month of *December*, 1734.

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Jos: Banks

I. De

I. De AMBRA GRYSEA. *Auctore* Caſparo Neumanno, M. D. *Chemiæ Profeſſ. Berolin. & R. S. S.* [*Vide* PART I. N° 433. & PART II. N° 434.]

PARS III.

SEcundum externum aſpectum mutiplex datur Ambra gryſea: 1. colore cinericeo, 2. albicans, 3. ſubflava, 4. cinereo-nigricans, 5. lævis, ac ſi corio ſuperducta eſſet, 6. colore puniceo, 7. cum ſtriis, 8. maculoſa, & 9. planè nigricans. (*a*) Ambra quæ nunquam deglutita ab animalibus fuit, ut & (*b*) quæ ab iiſdem deglutita ſeu devorata & poſtea rurſus in mare ejecta, vel etiam in ipſorum corporibus reperta fuit.

Hæc poſterior, ſcilicet Ambra quæ *deglutita fuit*, ut jam ante memoravi, eſt omnium viliſſima & leviſſima, nam utplurimum aliquid de loco manſionis ſeu fœtore animali ſecum ſervat, ſi proptereaque facilè à bona Ambra diſtingui poteſt. Sic & *planè nigricans*, & *penitus albicans* Ambra nullius valoris eſt, ſimiliter, quæ *lævis*, *uniformis* & *nimium pura externo viſui apparet*, quoque ſuſpecta, raro genuina, plerumque adulterata, ſi non penitus factitia vel compoſita exiſtit. Ea contra, quæ *coloris eſt cineritii* ſtriis dotata, vel etiam albicans maculoſa, nigrè vel flavè maculata, externa cruſta nigricanti prædita, licet quoque non adeo pura, ſed cum roſtellis avium, particulis ſepiæ, ſpinis piſcium, vel aliis rebus hinc indè commixta ſit, nihilo tamen ſecius pro optima habetur; Quanquam adeo neceſſa-

rium non ſit, ut ejuſmodi avium roſtra, ſimileſque impuritates ſemper admixta habeat, ſed utique, ſi eam accipere poſſumus, pura potiùs quam impurior, eligi poteſt: Hæc tantum ideò adduco, ut noſcatur, quod optima etiam Ambra variis plerumque quiſquiliis commixta eſſe ſoleat.

Primariæ proprietates bonæ Ambræ gryſeæ (exceptis iis, quas jam memoravi) ſequentes ſunt, ut ſit levis, contactu ferè ut cera, ſimul quidem friabilis, interim aliquantum tenax, ita ut ſub contuſione mortario vel piſtillo adhæreat, odoris fragrantis, ad candelam urentem facilè inflammabilis & conſtanter flammam ſervans, ſuper ignem vel candentem carbonem facilè liqueſcens, & nullius ſingularis nec amari nec auſteri, neque acidi neque ſalini ſaporis.

Ordinariò Ambram, ne multum perdatur, acu candente, vel alio ſubtili fervido inſtrumento *probare ſolent*, an ſit genuina nec ne? pungunt ſcilicet illa Ambram, tum circa acum, vel etiam ſupernè proveniens aliquid *ut fuſa reſina* apparere deber, vel projiciunt eam ſuper prunas, aut paucum quiddam in cochleari argenteo ſuper flammantem candelam liqueſcere faciunt. Hæc proba habet equidem ſuum uſum, verum ſi non accuratè exhalantem odorem cognoſcas, & adhuc varias plures alias circumſtantias obſerves, ſed unicè ad ſolam hanc liquefactionem attendas, tum & hæc uſitata proba fallere, ac in adulterata imo planè factitia Ambra itidem obtingere poteſt, nec minus ea proba, quam Dr Ettmûller olim commendavit, inquiens: Veram Ambram in manibus, ut cera, molleſcere, factitiam e contra friabilem eſſe; quæ proprietas verò per artificium

tificium æquè facili negotio induci valet, nec in ſe ipſa ſemper & ubique evenire ſolet.

Adulteratur Ambra gryſea, imo etiam *componitur* (à fraudulentis deceptoribus) cum cera, reſina, ſtorace, Benzoe, Succino, Ladano, Moſcho, Zibetho, ligno Aloës, carie fraxini, farina oryzæ, Moſco arboreo & ſimilibus, dum impoſtor alius ſuper alium ſemper meliorem proportionem & mixturam adinvenire ſtudet, quæ tamen fraus facilè quoque detegi poteſt.

1.) Ambra gryſea factitia & compoſita plerumque planè uniformis eſt, ex omni parte eodem colore atque mixtura, *inſtar maſſæ pilularum* vel paſtæ apparet, id quod in naturali Ambra nunquam ita æqualiter obtingere ſolet.

2.) Falſa ejuſmodi Ambra utplurimum *citius* in manu calida *molleſcit*, quam genuina.

3.) Sed omnium optimè talis Ambræ factitia *ex odore* cognoſcitur; nam ſicut verus Ambræ *odor* profectò *planè ſpecificus* eſt, cum nulla alia re in mundo comparandus, ita quoque non tam facilè ars ipſum imitari poterit, ſed modo hoc, modo illud ex adventitiis vel immixtis ingredientibus *odore prævalebit* & fraudem prodet; idque tantò magis cognoſcetur, ſi ejuſmodi Ambra carbonibus candentibus inſpergatur, vel in cochleari argenteo ſuper candelam flammantem, vel etiam particula immediatè ad candelam flammantem detineatur, *halitus olfactu percipiatur*, ſimul quoque *ad liquationem & incenſionem* attendatur: Genuina ſi exiſtat Ambra, tum ſub liquatione *bulliet*, poſt liquationem permanebit *fuſca*, & ultimò *odorem ſuccini æmulum*,

lum, quantumvis debiliorem, quam ſuccinum commune, de ſe ſparget; ſi vero falſa ſit, tum & hæ proprietates nunc hîc, nunc alibi *deficient ac aberrabunt*. Nam

(*a*) hæc vel planè non, vel ſerius, aut longè citius liqueſcet.

(*b*) In ebulliendo, & exhalante odore multò aliter ſeſe geret, dum *vel fœtidum quid, vel fragrantius*, vel planè aliud quid olens, quam veræ Ambræ exhalationes ſunt, ex ſe demittet.

(*c*.) Tum quoque poſt toſtionem & peractam ebullitionem non in eodem aſpectu permanebit, uti vera Ambra, ſed vel *carbonarium vel cinereum, vel terreum*, adeoque penitus *alium externum aſpectum*, etiam ratione coloris, monſtrabit.

4.) Quod ſi ejuſmodi Ambra occurreret adulterata, quæ *nullo peregrino odore* imbuta, ſed fortè cum re quadam, nullo odore prædita, compoſita ſit, e. gr. cum muſco arboreo gryſeo, & cui, ratione odoris, & melioris occultationis gratia, nihil niſi ipſa Ambra gryſea admixta, proptereaque nullo alio, quam vero Ambræ odore imbuta ſit, tum tamen & hæc fraus facile detegi poſſet: (α) talis enim Ambra in hac proportione *nimis parcè aut debilius* olebit, (β) eadem carbonibus candentibus inſperſa *copioſius fumabit*, ſi non apertè *fœtebit*, (γ) *nec æqualiter ex omni parte liqueſcet*, neque ſub liquatione ita bulliet uti genuina, (δ) denique *non tam facilè* à flamma candelæ accendetur, nec minutæ candelæ adinſtar *abſque intermiſſione* ad conſumtionem uſque flammabit, quod genuina tamen Ambra monſtrat.

5. Porro

5. Porro omnis factitia vel adulterata Ambra *ſub ſolutione* ſe prodet, & longè aliter ſe geret, quam vera.

6.) Denique etiam *in deſtillatione aperto igne*, in qua falſa perquam recedit; ut alias probas jam præteream.

Vera proinde Ambra gryſea eſt *Bitumen*, & quidem, inter nota hactens bitumina, *ſuccinum proximè æquans*, vel ei accedens, excepta duritie, ac pellucidi-tate: Proximum eſt ipſi in ſua mixtione non tantum præ reliquis bituminibus, nec ſolum præ omnibus aliis mineralibus, verum & *præ omnibus cæteris rebus in univerſo mundo*, quoque etiam modo appellentur, prout ulterius percipiemus.

Quanquam vocabulum Bitumen nihil aliud ſignificet, quam mixtum quoddam minerale, tamen plurimi hiſtoriæ naturalis Scriptores illud ad hanc ſpecificam ſignificationem redegerunt, quod ejuſmodi mixtum propriè ſit *Pinguedo terræ tenax*, *facile urens*, cum quo charactere noſtra etiam Ambra gryſea perfectè convenit: *a*) Baſin & plurimum pondus partium ipſius eſſentialium conſtituit pinguedo ſive *oleum*, & in unica Ambræ gryſeæ drachma ad minimum ϶ ii ß vel $\frac{5}{6}$ præſtò ſunt, ita, ut & hic, ſecundum regulam ſcholarum, à potiori ſit denominatio, propter ſuperpondium conſtitutivi, Ambra non incommodè *pinguedo* vocari poſſit; *b*.) cum vero iſta pinguedo, vel hoc in Ambra contentum oleum nec vegetabile, nec animale, e contra apertè & abſque contradictione *minerale* ſit, hinc illud optimo jure *pinguedinem terræ* appellare licebit; *c*) Ambram corpus *tenax*, vel pinguedinem *tenacem* eſſe, reſpectu aliarum pinguedinum, de hoc nemo diſputabit, nec in dubium vocabit, alias enim facilè

facilè contundi ac pulveriſari poſſet, nec ita piſtillo & mortario adhæreret, *d*) Quod denique *facilè urens* ſit, itidem cuivis facillimè demonſtrari poteſt, dummodo particula Ambræ *candelæ flammanti* admoveatur: adeoque nihil deeſt de requiſitis bituminis qualitatibus & ante memoratis characteriſticis expreſſionibus aliorum Autorum.

Quod vero dixerim: hoc ſubjectum, Ambram gryſeam, *præ omnibus cæteris rebus in univerſo terrarum orbe, ſuccino proximè accedere*, illud nullatenus tanquam nuda cogitatio vel conjectura ſuſcipienda eſt, ſed experientia ipſa hoc me edocuit, nam

(1.) Ambra gryſea per ſe, & in forma *ſicca* ſuper nudo igne liquefacta & fuſa, adeoque ſenſim ſenſimque exhalans, & ſic etiam *ſuper pruna*, revera præeminentem ſuccini *odorem continet*; ſi vero Ambra cum aqua igni applicetur, tum quidem pari ratione liqueſcit adinſtar reſinæ, & inficit aquam aliquatenus odore Ambræ, licet ei ſe non immiſceat, qui odor quoque facilè rurſus per deſtillationem ſeparatur; verum cingens eam humiditas impedit ſimul reſolutionem mixti, & exhalationem aliquarum partium eſſentalium, brevi! hac ratione odor ſuccineus non ita prodit, ac ſub liquatione ſicca.

(2.) Ambra gryſea etiam *in præparatione vernicis* eodem modo ſeſe habet, uti Ambra citrina, vel ſuccinum, ſcilicet ſi Ambra liqueſcat, eique poſtea oleum ſeminis lini ab omni aqua liberatum effundatur, vel alii vernices leniter oleoſi cum ea miſceantur.

(3.) Denique omnium optimè eos convincit *Deſtillatio Ambræ* gryſeæ igne aperto, in hac enim *planè omnia perfectè & proximè ita ſeſe habent, uti*

uti in ſuccino: Eruditus & celebris olim Dr Herman Nicolaus Grimm, qui per longum tempus in India Orientali fuit, quondam unciam unam Ambræ gryſeæ ex retortâ vitrea igne aperto gradatim deſtillavit, & exinde (prout Relatio ipſius in Ephemeridibus Naturæ Curioſorum à quovis perlegi poteſt) primò liquorem aqueum, deinde (ut exprimit) liquorem ſpiritualem, porro oleum coloris flavi, paucum quiddam ſalis volatilis, & in retorta reſiduum quoddam, adinſtar picis, recepit, ubi clarè ſimul perhibet, N. B. *Quod liquor, oleum, ſal volatile & reſiduum, adeoque omnes partes eodem planè aſpectu, eidemque proprietatibus, quam partes ex deſtillatione ſuccini provenientes fuiſſent*, exceptò quod oleum fragrantiorem paulò odorem ſparſerit *. Jam hæc deſtillatio ſatis & ſufficienter ad plenariam convictionem mihi ſufficere potuiſſet, ſi aſſuetus eſſem in ejuſmodi caſibus unicuique ſtatim fidem adhibere, vel ei inniti, quod multi fortè tanto certius feciſſent, dum longè precioſius eſt, in his noſtris regionibus ejuſmodi experimenta imitari, quam in India Orientali, vel in illis locis, qui Ambræ natales ſunt; nihilo tamen ſecius experimentum iſtud, quamvis in minori portione, ad proprium meum lapidem lydium examinavi, & melioris certitudinis gratia ipſe ſum imitatus, *ſingulaque omnino eodem prorſus modo inveni*, hoc tantum diſcrimine in deſtillatione mea intercedente, ut planè *nullum ſubſtantiale reſiduum*, ſed ex una Ambræ gryſeæ drachma, admodum parum pulveris, qui vix ac ne vix quidem pro grano uno æſtimari poterat, impetraverim, quod ve-

* Ephemer. Nat. Curioſ. Dec. 11. Ann. 1. pag. 405.

ro rei ipſi vel experimento Dn Grimmii nihil prorſus derogat, ſed diſcrimen exindè fortè ortum fuit, quod ille in ſua deſtillatione *paulò citius* deſierit, vel ultimò *non ſatis fortem ignem* adhibuerit, quo in caſu utique ejuſmodi reſiduum remanet, quæ immutata circumſtantia etiam in ſuccino ratione reſidui magnas variationes monſtrat, & ego e contra meam Ambræ gryſeæ deſtillatiònem tamdiu ac eo uſque igne proſecutus ſim, quantum fieri potuit, ut de induſtria perſpicerem, an quicquam materialiter fixum vel ſalinum, vel ſaltem terreſtre reſiduum manere vellet? unde demum *nihil ſubſtantialis*, ſed *vix parum viſibilis pulveris* remanſit, adeoque expertus fui, quod tota Ambra gryſea continuatione & violentia ignis deſtillari, ac in altum propelli poſſit. Cæterum itidem *Aquam, Oleum & ſal obtinui.* Ex Drachma unica Ambræ recepi ℈ii ß olei, 5 gran. Aquæ, 2 gran. Salis, & circiter 1 gran. pulveris, reliqua 2 gran. quæ deficiunt, *partim allinendo ad latera, partim exhalando & evaporando perierunt : Oleum & ſal, tanquam duæ primariæ partes*, ejuſdem indolis fuerunt, *quam oleum ac ſal volatile ſuccini, adeoque nullatenus urinoſo-volatilia.* Ex qua ingredientium vel partium conſtitutivarum proportione hoc demum in conſiderationem duci poteſt, quod tamen *adeò pauca ſalina & terreſtris ſubſtantia* nihilominus talem longè majorem partium oleoſarum portionem condenſare, vel in ſtatum firmum tenacem, planeque ſiccum reducere poſſit; item, quod hæc quoque circumſtantia, majori ex parte, itidem cum ſuccino conveniat, per conſequens *affinitatem ejus & hac in parte confirmet.* Unum illud adhuc dixerim,

dixerim, non in omnibus Ambræ ſpeciebus ſubſtantiale quid ſalinum ſeparari poſſe, quum pauxillum illud oleo copioſo facilè ſe involvat.

Cum igitur precioſa hæc materia, Ambra gryſea, præcipuas ſuas vires exſerat *odore*, & quidem *fragranti*, hinc quoque jam multo à tempore, ad hunc uſque diem ea maxima ex parte tantum ad ejuſmodi res, *quæ ſuavi odore præditæ eſſe deſiderantur*, ſcilicet ad Balſama, Pulveres ſternutatorios, dentifricios, Electuaria pro dentibus, Pulveres ad crines (vulgò *Poudre*) globulos ſaponaceos, & veſtimenta vario odore imbuta, adeoque ad res delicatas magis quam utiles adhibita fuit. Cum etiam, prioribus temporibus, Ambræ *variæ qualitates medicamentoſæ*, virtutes analepticæ, aphrodiſiacæ, cephalicæ, apoplecticæ, bezoardicæ, nervinæ, aliæque plures attributæ fuerint, hinc & in officinis pharmaceuticis (quanquam olim copioſius quam hodiè) ad diverſa præparata & compoſita, magis tamen ad Galenica quam chymica, & communiter in forma pulveris uſurpata fuit. Sed iſta omnia & ſingula prætereram, ac unicum tantum idque hactenus maximè uſuale *præparatum* ex Ambra, nimirum *Eſſentiam Ambræ gryſeæ, & quidem Eſſentiam ſimplicem* adducam, in qua nihil ulterius, quam ſola Ambra cum menſtruo accedit, idque ex hac ratione, quia etiam hac in parte; ratione *ſolutionis Ambræ* unum ac alterum in laboribus meis obſervaverim, quod in aliis editis Scriptis hucuſque non reperi.

Hactenus pro certa & explorata re habitum ac creditum fuit, *ſpiritum vini rectificatum per ſe Ambram gryſeam non ſolvere*; ex hoc ipſo quidem Autores argumentum ſuum deſumſerunt, vel hanc

 conclu-

concluſionem ex eo formarunt, quod Ambra gryſea nec vegetabile, nec animale, neque reſina, neque corpus oleoſum pinguedinoſum ſeu reſinoſum, ſed *bituminoſum minerale* ſit, quia ſpiritus vini rectificatus *perparum eam aggrediatur*, *multò minus ſolvat*, verùm eodem modo ſe habeat, ac circa Aſphaltum, ſuccinum, & alia bituminoſa mixta, ex quibus equidem paucum aliquid extrahat, ſed nunquam perfectam ſolutionem formet; quin ipſe eruditiſſimus Profeſſor Hallenſis Dⁿ Dʳ Hoffmann, eximium illuſtris hujus Societatis membrum, quodam in loco *, " Omnia corpora reſinoſa, in-
" quit, levi labore in Spiritu vini rectificatiſſimo
" phlogiſto ſolvuntur & extrahuntur, ſed N. B. *Id*
" *ipſum non fiat cum Ambra, quæ difficillimæ eſt*
" *ſolutionis in ejuſmodi Spiritu.* Et quia obſer-
" vamus, corpora inflammabilia, quæ ex terra naſ-
" cuntur, ut Succinum, Bitumen judaicum, car-
" bo foſſilis, etiam difficilioris eſſe Solutionis *neque*
" *tam lubenter conjugium inire* cum liquore valde
" Spirituoſo, hinc ſubſcribimus eorum ſententiæ,
" qui ſtatuunt, Ambram ad Bituminis genus eſſe
" referendam, cujus natales ſunt in terra, &c. Et
" porro ait: Cum igitur tam difficilis ſolutionis
" ſit Ambra, hinc certè nullam adhuc genuinam
" Ambræ ſolutionem in officinis conſpicimus. Nam
" eam plerumque parare ſolent cum Moſcho, cum
" oleis eſſentialibus Cinamomi, & aliis, vel etiam
" Zibetho, & ita poſſidemus quidem ſuaviſſimi o-
" doris Eſſentiam, quæ quoque non caret ſua vir-
" tute & uſu, at *parum participat de Ambra*, quæ
" potius *intacta* remanet." Qantum huc uſque ra-

* Ej. Obſervat. Phyſic. chym. Select, Lib. I. Obſerv. XVIII. pag. 67, &c.

tione

tione ſolutionis Ambræ cum Spiritu inflammabili ſeu ardente in mundo cognitum eſt, tantum de jure ea profert Dn Dr Hoffmannus, nec quiſquam alius ulla ratione cum fundamento hanc ſententiam refutavit, præcipuè cum in genere ejuſmodi ſolutio, inprimis *in Spiritu vini rectificatiſſimo per ſe* non modo difficillima, ſed & plenaria ſolutio ferè *impoſſibilis* habita fuerit; cum vero ex mea experientia planè contrarium, nempè non tantum poſſibilitatem, ſed etiam facilitatem hujus, alias nunquam creditæ ſolutionis ipſe viderim, hinc ſpero, detectionem hanc jam communicatam, nec ante memorato Dn Dr Hoffmanno, Fautori meo æſtimatiſſimo, nec cuiquam alii faſtidioſam, Societati Regiæ potiùs gratam futuram eſſe, utpote quæ ne minimum ejus, quod majorem rei alicujus illuſtrationem atque evolutionem nobis dare poteſt, rejicere nec contemnere ſolet, quin potiùs, quæ fortaſſis lætitiæ illius, quam ſentio in detectione harum vel illarum, licet ſæpe ſic æſtimatarum minutiarum, aliquatenus participem ſeſe reddet, perpendens, quod fructus iſte ex exiguo ipſius veſtræ arboris ramulo oriatur.

Totum proinde negotium ſolutionis Ambræ in Spiritu vini rectificatiſſimo plane non conſiſtit in ſingulari artificio, multò minus arcanum quippiam redolet, prout id fortè quidam, in præparatione bonæ EſſentiæAmbræ ſibi effinxerunt, ſed requirit tantum *parvam* quandam, ut conjicio, hactenus non animadverſam *encheireſin*. Recipe modò bonum ſummè rectificatum Spiritum vini tartariſatum (quamvis in caſu neceſſitatis & *ſimplex* non tartariſatus Spiritus vini rectificatiſſimus idem efficiat) eique injice partem duodecimam puræ genuinæ & in fruſtula

confractæ Ambræ, repone ea non in lenem, ſed in ejuſmodi digeſtionem, quæ pedetentim ita incaleſcit, ut Spiritus vel menſtruum incipiat *ebullire*, quippe quod unica encheireſis eſt, tum plenaria ſolutio inſequetur, ſiquidem ego ſemper ℈ii Ambræ in ℈i. Spiritus diſſolvi, & tantummodo impurum iſtud, *quod Ambra non fuit*, ſed in alieno-terreis, vel aliis ad mixtionem Ambræ non pertinentibus ſordibus, pondere interdum 2 vel etiam tantum 1 gran. librantibus, conſiſtit, tanquam reſiduum vel non ſolutum in fundo vitri reperi. Qui extemporaneam hujus rei certitudinem capere vult, is in vitro non penitus adimpleto, & ex metu diffractionis non firmiter nimis, ſed leviter obturato, ſuper prunas, vel planè ſuper candelam flammantem experimentum inſtituat, tum ſimulac Spiritus vini ebullire incipiet, à veritate convincetur. Quod ſi vero pro menſtruo recipiatur Spiritus inflammabilis *oleoſus*, ſive ille ſuper unum aut alterum vegetabile oleo præditum *abſtractus*, ſive ejuſmodi Spiritus vini rectificatiſſimus cum oleo quodam eſſentiali *inſtillando imbutus* ſit, tum ſolutio pro gradu temporis *tantò ocyus* ſuccedit, & de reliquo *neque Spiritus roſarum*, neque alius Spiritus abſtractitius, N. B. *Niſi oleo dives, vel particulis oleoſis præditus ſit*, hic, ratione energiæ ſolventis, præ Spiritu vini rectificatiſſimo ſimplici ullam prærogativam poſſidet.

Jam circa hæc ſequentes adhuc circumſtantiæ notandæ ſunt:

1. Quod ſi Spiritus vini rectificatiſſimus ſimplex abſque alcali, vel etiam Spiritus vini tartariſatus ſuper ſal Tartari modò *abſtractus* aſſumatur, tum equidem in antedicta proportione itidem plenaria ſolutio

ſolutio procedit, ſed iſta ſolutio, vel ſic vocata Eſſentia Ambræ, plerumque *non eſt ſatis obſcurè vel rubicundè tincta.*

2. Id quod reſiduum eſt, aſpectu *non parvum* exhibet *volumen*, ita ut plurima, vel ſatis multa pars Ambræ quaſi inſoluta appareat, cum tamen reverâ, ſi ſolutio filtratur, & *in filtro remanens ſiccatur ac ponderatur*, illud certè perquam paucum, *purè pulverulentum*, vel tenerè terreſtre aliquid ſit, ſi genuina modò Ambra adhibita fuerit.

3. Si *Spiritus non ſufficienter dephlegmatus, vel non ſufficiens calor* adhibeatur, tum aut nulla ſolutio, aut nuda tantum ac *ſimplex extractio* inſequitur.

4. Sin vero ejuſmodi Spiritus vini tartariſatus, qui cum ſale Tartari tantum *in infuſione* abſque inſequenti abſtractione ſtetit, ad ſolutionem in uſum vocetur, tum ſolutio *citius* & melius *tingetur.*

Ex quatuor hiſce circumſtantiis ſequentia proindè conſectaria & explicationes fluunt.

(*a*) Cum plerumque in Eſſentia Ambræ *color* ſimul quæſitus fuit, fortè non pauci cum Spiritu vini ſolutionem habuerunt, quæ vero, *quia parum tincta* apparuit, pro tali non habita nec cognita eſt.

(*b*) Idque tantò minus, cum *reſiduum tam apparenter copioſum* conſpexerunt, quod & me ipſum in principio offendit, ut ſemper judicarem, parum vel nihil ſolutum eſſe, donec tandem illud ſiccarem & ponderarem, indeque perſpicerem, quod hoc non tantum perquam paucum, ſed adhæc quoque *purè pulverulentum* alienum quid ſit, ad ſolutionem vel Eſſentiam Ambræ nequicquam pertinens.

(*c.*) Vel ſi alicui hæc ſolutio nondum ex ſententia ſucceſſit, tum (1. vel *inſufficienter rectificatus* Spiritus vini, vel (2. ſi & hic aſſumtus ſit, *debitus fervor non* adhibitus fuit, & fortè plerique cogitarunt, Ambram eſſe materiam fragrantem, quæ, ſi nimis fortiter digeratur, vel infuſum valido æſtui exponatur, quoad partem optimam atque ſubtiliſſimam exhalaret, unde calorem lenem adhibendum eſſe, quanquam etiam revera *non ad omnes ſpecies* Ambræ vehemens ejuſmodi fervor requiratur, & ſolutio nihilominus ſuccedat.

(*d.*) Denique & hæc concluſio exinde ſequitur, ſi quis rubicundè tinctam Eſſentiam acceperit vel habuerit, ac, præter menſtruum, nihil aliud quam Ambram gryſeam adhibuerit, quod menſtruum iſtud ſemper *Spiritus vini per infuſionem tartariſatus* fuerit, unde Tinctura originaliter non ex Ambra, ſed *ex ſale alcalino fixo* procedit, quæ tum à partibus oleoſis Ambræ tantummodò exaltatur. Certitudo hujus circumſtantiæ elucet, ſi Spiritus vini rectificatiſſimus oleoſus *tantum cum ſale Tartari per ſe* digeratur, inde enim rubicunda Tinctura prodit, quam Tincturam Tartari appellant. Si Spiritus hic vini non eſt oleoſus, tum nec Tinctura Tartari adeo pulchra fiet, ſed vix flavo colore tingetur, vel planè nullo: cui vero ſi unam vel duas guttulas *olei eſſentialis*, e. gr. olei Aniſi, inſtilles, Tincturamque obſerves, tum id, quod dixi, in momento, nempè augmentationem & ſaturatiorem Tincturæ colorem evidenter videbis.

Concluſio hujus rei proinde hæc eſt: (*a*) Quod ſi Ambra gryſea cum puro Spiritu vini rectificatiſſimo, vel etiam cum Spiritu vini per abſtractionem tar-

tartariſato tractatur, tum *plena quidem obtingit ſolutio, ſed abſque ſingulari Tinctura:* (β) Si verò eadem Ambra cum Spiritu vini per infuſionem tartariſato, eâdem methodo, tractatur, tum non modo ipſa contingit ſolutio, verum etiam *tincta ſolutio*, quæ Tinctura autem imprimis, *à ſale Tartari in ſubſtantia hic magis exiſtente* dependet, proindeque potiùs ut Tinctura Tartari ratione coloris conſideranda eſt, (γ) Si autem paulò fortior, quam Tinctura Tartari tincta apparet, tum *partes oleoſæ Ambræ* pari ratione ad augmentationem coloris hujus Tincturæ contribuerunt, ac ſi alii Tincturæ Tartari, ad quam nulla Ambra adhibita fuit, unam vel aliquot guttas alius olei inſtillaſſes: (δ) Si proinde *Spiritus roſarum alcaliſatus*, vel fermentatione, vel etiam repetita ſuper roſas abſtractione factus, pro menſtruo ad præparationem Eſſentiæ Ambræ adhibitus, & cum eo egregia Ambræ Eſſentia parata fuerit, nemo exinde concludere debet, ac ſi Spiritus roſarum *ſolus ſingulare planè & appropriatum Ambræ gryſeæ menſtruum* ſit: Nihil enim aliud, aut nihil magis hîc fit, quam quod à me jam dictum eſt, nempe in Spiritu roſarum alcaliſato 1.) *aliquid ſalis alcali*, 2.) nec non *quædam partes oleoſæ* adſunt, exindè oritur Tinctura eâdem ratione, ac ſi Tincturam Tartari ex ſale Tartari cum Spiritu vini *oleoſo* abſque Ambra & abſque roſis præparo, ſolutioque Ambræ ſemper procedit tanquam ſolutio cum alio Spiritu vini tartariſato, vel etiam ſimplici rectificatiſſimo abſque ſale Tartari.

Quod verò ejuſmodi Eſſentia ſive ſolutio Ambræ, quæ cum bono *Spiritu roſarum* decenti methodo parata fuit, *longè fortiorem & gratiorem odorem ſpargat*,

ſpargat, quam alia cumſimplici Spiritu vini elaborata, hoc planè naturale eſt: 1. enim Spiritus roſarum per ſe non modò *fortem*, ſed & *fragrantem odorem*, ſimplex e contra Spiritus vini ferè *nullum* habet: 2. Notum eſt, Ambram gryſeam illius naturæ ac indolis eſſe, ut per ſe *non adeo ſingularem odorem* ſpargat, ſimulac verò ei aliud quicquam, *per ſe fragranti & forti odore præditum* admiſcetur, tum ſtatim *odor atque fragrantia Ambræ* quaſi è ſomno evigilatur, excitatur, & reverà *exaltatur:* hoc ergo quoque ſub ſolutione cum Spiritu roſarum eodem modo contingit, proinde penitus naturale quicquam eſt, quod hæc mixtura ſeu ſolutio eminenter *fragrantius odoret*, quam ea, quæ nudo Spiritu vini parata fuit.

Non incongruè igitur officinalis Eſſentia Ambræ cum Spiritu roſarum alcaliſato propter auctiorem odorem parari poteſt; cum verò non pauci quoque homines occurrant, qui *odorem & ſaporem roſarum* ferre nequeunt, hinc nec ii malè facient, qui præter hanc Eſſentiam roſatam adhuc quoque *Eſſentiam Ambræ puram*, nempe tantum cum Spiritu vini rectificatiſſimo & alcaliſato paratam, in officinis pharmaceuticis in promptu habent. Quo verò Tinctura hæc ſatis efficax ſit, & ſolutio tantò citius abſolvatur, nec color tinctus emaneat, hinc menſtruum ſeu Spiritum vini *dupliciter alcaliſare* juvabit, præparetur ſcilicet primùm juſtè bonus Spiritus vini tartariſatus per abſtractionem, vel *deſtilletur* genuinus Spiritus vini rectificatiſſimus aliquoties ſuper ſal alcali fixum, & hic ita ſemel alcaliſatis adhuc ſuper purum ac calcinatum Sal alcali fixum *infundatur*, aliquantum digeratur, tandem decantetur, & ut menſtruum pro

Eſſentia

Eſſentia ſive Solutione Ambræ adhibeatur, tum hic, *ratione virtutis ſolutivæ*, eodem modo, ac optimus & pretioſiſſimus Spiritus roſarum ſe geret, imò ſi Spiritus roſarum non fuit tartariſatus, vel alcaliſatus, ei *prærogativam adhuc dubiam reddet.*

Incidit hic mihi in mentem, quod celebris olim Dr Ettmûller alicubi ſcribat *: Ambram cum roſis *in fermentationem deduci*, indeque *Spiritum roſarum Ambratum* confici poſſe, qui margaritis præponendus ſit, tanquam ſummum analepticum & confortativum; verum cum aqua, ut ordinarium corporum fermentandorum menſtruum, Ambram ne minimum quidem attingat, & cum roſis ex parte Ambræ impoſſibiliter vera confermentatio obtingere poſſit, hinc adducor, ut credam, eſſe vel ſphalma typographicum, vel auditum decepiſſe Dm Ettmûllerum, dum fortè quidam ipſi aliquando dixit: cum benè fermentato & rectificato Spiritu roſarum & Ambra, Spiritum ambratum gratumque confici poſſe. Quod ſuaviter fragrans Spiritus roſarum, etiam ſine Ambra, margaritis præponi mereatur, hoc equidem in dubium non vocabo, attamen *tantum ratione fragrantiæ*; nam ratione virtutis analepticæ margaritas adhuc lapidibus cancrorum, imo etiam tantum depuratis vulgaribus oſtrearum teſtis poſtpono; ſed hæc in tranſitu.

Denique reſtat adhuc, ut probem ac demonſtrem ea quæ dixi: Spiritum nempe inflammabilem *oleoſum*, *ſolutionem Ambræ promovere & accelerare*, quod facilè quivis oculis cernere poteſt: Accipiatur Spiri-

* Mich. Ettmülleri Opera Pharmac. chym. in Schrôdero dilucid. p. 79.

tus inflammabilis rectificatiſſimus, eique fruſtula Ambræ injiciantur, ſi igitur illa dilabi nolle videas, tum inſtilla aliquot tantum guttulas hujus vel iſtius puri, *cum oleo expreſſo non adulterati, olei deſtillati* eſſentialis, tunc, quod dixi, manifeſtè vel brevi ad oculum patebit; Ratio, quare hoc fiat, non à longinquo peti opus habet, ſed hæc eſt, quia *ejuſmodi olea* ipſammet Ambram ſolvunt, ſiquidem non modo cum variis aromaticis fragrantibus oleis eſſentialibus, ut cum oleo Lavendulæ, Menthæ, & ſimilibus aliis, ſed etiam cum Italico oleo Citri (*oglio di cedro,*) porro cum reſinoſo oleo Terebinthinæ, nec non cum oleo bituminoſo, ad ejus familiam pertinente, puto rectificato *oleo ſuccini* experimenta feci, & ubique cum his oleis ſolutionem perfeci; e contra cum *oleo expreſſo, ut oleo Amygdalarum*, ne minima quidem ſolutio neque extractio inſequi voluit. Ex quo tantò evidentius videre licet, quod Eſſentia Ambræ Schrôderi †, qui Ambram primùm cum *oleo amygdalarum* digerere, exprimere, & ſuper hoc expreſſum poſteà Spiritum vini rectificatiſſimum abſtrahere docet, abſurda & pro diſpoſitione ad ſolutionem magis *apertè impediens* quam promovens ſit.

Sic quoque pro intentione ſolvendi Ambram cum *Spiritibus dulcificatis* tam alcalicis quam acidis tentamina inſtitui, proindeque Ambram gryſeam *a.*) cum Spiritu vitrioli dulci, *b.*) cum Spiritu nitri dulci, & *c.*) Spiritu ſalis dulci, nec non cum Spiritibus alcalicis dulcificatis, ut *d.*) cum Spiritu urinæ dulci, ſeu ita dicto Spiritu ſalis ammoniaci vinoſo cum calce viva,

† Pharmacop. Medico-chymica, Lib. III. cap. 29. pag. 502. Edit. Witzel, 1677.

item

item *e.*) cum ſale Tartari parato, infudi & digeſſi; verùm hi *vix paucum quippiam extraxerunt*, nec Ambram penitus aggredi aut eam ſolvere voluerunt. Circa unicam cum *Spiritu vitrioli dulcificato* factam infuſionem ſingulare quicquam videre licuit, dum hic Spiritus cum pauco iſto, quod extraxerat, *aliquot granula ſalina* formavit, quæ ad latus vitri, in quo infuſio peracta erat, ſeſe appoſuerunt.

Ultimò adhuc quoque pauca quædam adjicere liceat *alba illa, tanquam ſebum apparente materia* viſcoſa, quæ communiter ex ſolutione ſeu Eſſentia Ambræ ſeſe *præcipitare* vel ſeparare ſolet, quam D^n *Lemery ceram eſſe* exiſtimat, eamque pro argumento adhibere, vel conterraneis naſum cereum attexere, ac cum ea probare vult, quod ex hac circumſtantia ocularitèr demonſtrari poſſit, Ambram gryſeam *nihil aliud quam ceram eſſe*, vel ab apibus provenire, in qua opinione tamen hic alias peritus vir penitus à vero aberravit.

Circa hanc ſe præcipitantem materiam ſequentia ergo obſervavi:

(1.) Quod ea non ſemper, nec ſemper tam citò ſe &.

(2.) Quid ipſa revera ſit.

1. Quod ſi hæc alba materia ſeſe ſeparat, tum communiter *tres circumſtantias* circa eam obſervavi, quæ ad præcipitationem, niſi omnes tres conjunctim, ſaltem unica earum abſolutè requiruntur, (*a*) Sivè enim Eſſentia vel Solutio in ejuſmodi vitro ſtetit, quod non planè impletum, ſed cujus tertia vel dimidia pars vacua fuit, (*b*) Sive orificium vitri ne-

 gligentius

gſigentius obturatum fuit, unde Spiritus ſubtiliſſimus ſenſim ſenſimque exhalavit, ideoque pro exhalationis hujus proportione aliquid de ſoluta Ambra rurſus excidit, (c) vel etiam ſolutio adhuc ſuper aliqualem partem inſolutæ Ambræ ſtetit. Nam ſi ſolutio mox de remanentia ſua decantetur, vitrum cum ea penitus impleatur, idque ſollicitè & firmiſſimè obturetur, atque ab exhalatione præcaveatur, tum non tam citò quicquam præcipitatum fuit, nec ejuſmodi albicans materia apparere voluit, adeoque *evaporatio tenuiſſimi Spiritus eſt vera cauſa principalis*, ita ut Spiritus hic iſtud, quod anteà ſolutum tenuit, in fuga ſua rurſus demittat.

2. Ipſa autem *hæc albicans materia*, quam Dn Lemery *pro cera habet*, nihil aliud eſt, quam *depurata quaſi, vel reducta perfecta Ambra*, quod exinde probo, quia Spiritus vini rectificatiſſimus, vel aliud menſtruum ad hanc ſolutionem Ambræ jam adhibitum, ſi nempè albicantem hanc ſubſtantiam denuo eâdem methodo, ut antea Ambram, rurſus tracto, eam quoque iterum plane ſolvit & imbibit. Fiat è contrario proba cum cera & Spiritu vini rectificatiſſimo, an hic Spiritus ceram quoque tam facilè ſoluturus, imbibiturus, vel eodem modo ei ſe commixturus ſit? ut alias circumſtantias jam præteream.

Poſſem quoque adhuc unum & alterum *de Eſſentiis Ambræ compoſitis*, aliiſque *præparatis Ambratis* adducere; verum cum hæc diſquiſitio jam magis increverit, ac in principio cogitaſſem, adhæc quoque ejuſmodi materiæ propriè ad propoſitum mihi ſcopum non pertineant, hinc colophonem hiſce imponam, & de reliquo ſemper gaudium exinde mihi

mihi parabitur, ſi quis mihi meliores, magis ſufficientes, magiſque *demonſtrabiles* relationes de Ambra gryſea, ejus *origine*, *natura* & *mixtione* impertietur.

Berolini d. xv. Octobr. 1729.

Caſpar Neumannus, *M. D.* Profeſſ. Chymiæ, Societatum Scientiar. Reg. Magn. Britt. & Pruſſ. ut & Acad. Nat. Curioſ. Soc.

II. *Editoris* Recenſio *Experimentorum circa* Ambram Gryſeam *à Domino* Joh. Browne, *R. S. S. & à Dno.* Ambroſio Godofredo *Hanckewitz*, R. S. S. *inſtitutorum, cum D.* Neumanni, *R. S. S. Experimenti ſui* vindicatione.

MAndatum fuit Chemicis expertiſſimis Regalis Societatis ſociis digniſſimis Dnis Browne & Godofredo *Hanckewitz*, ut Operationem de Ambra gryſea à clariſſimo D. Neumanno chemiæ profeſſore & *R. S. S.* inſtitutam ſedulò repeterent.

D. *Browne*, cùm cenſeret clariſſimum Dⁿ profeſſorem nimis parvam quantitatem, ſcilicet Drachmam unicam, in experimento ſuo adhibuiſſe, ſumſit Ambræ gryſeæ unciam & ſemiſſe, cum terra cimolia alba ſiccatiſſima (qua ſemper utitur ad ſalem

ex

ex Succino eliciendum) in pulverem redactam, quam Retortæ inditam variis Caloris expoſuit gradibus: obtinuit primò phlegma aquæ puriſſimæ inſtar pellucidum, dein Spiritum Cereviſiæ inſtar fuſcum, huic ſuccedebat oleum colore magis fuſco, ultimo habuit, per ignem fortiſſimum, Balſamum ſpiſſum, nigrum. Ex quibus oleum quidem & Balſamum cum illis, quæ ex Succino prodeunt, odore tenus convenire faſſus eſt, ſed nullum omninò ſalem acidum volatilem, uti ex Succino, elicere potuit, nec Spiritus hic Ambræ gryſeæ ullum motum cum alcalicis dedit, quemadmodum ille ex Succino tali ſale acido abundat. Illud autem acidum volatile, ſingulare Succini *Criterion* reputat. Reſiduum quoque ex Succini diſtillatione, durum eſt, nigrum & Gagatis inſtar, ex hujus vero diſtillatione, cimolia remanſit pulvis, nigredine ſolummodò tinctus. Cum nullam igitur Aciditatem, nullam volatilitatem per totam operationem deprehendere potuerit, an Ambra gryſea ſit Excrementum animale necne, in dubio relinquit: ſed notat omne ſuaveolentum, omne gratum leniſſimo igne perire.

D. *Godofredus*, primò duas Ambræ gryſeæ uncias duplici Arenæ albæ puriſſimæ ponderi miſtas ex Retorta diſtillavit; ſecundò alias duas uncias ſimiliter diſtillavit, habuitque in utraque operatione oleum limpidum, & reſiduum bituminoſum: oleum per ſe rectificatum dedit phlegma ſaporis gratè ſubacidi, quaſi aceti dilutioris, & deinde ſequutum eſt oleum limpidum, balſamicum, bituminoſum, petroleo ſimile: tertiò diſtillavit ſemiunciam Ambræ gryſeæ per ſe, eademque per ignem ſatis moderatum obtinuit; poſtquam ad ſummam ſiccitatem Ambram gryſeam diſtillaverat,

laverat, ursit reſiduum igne maximo, & remanſerunt ultimo grana tria Terræ albæ ſalinæ, cum acidis modicè effervescentis vel Aëri humido expoſitæ per deliquium fluentis. Cum ex carbone ceu Reſiduo nigricante duarum primarum operationum nullum ſalem volatilem, nullum elicere potuerit phoſphorum, pronuntiat certiſſime Ambram nec animale quid, nec Excrementum animalis eſſe; phoſphorum enim ex omnium notorum Animalium excrementis obtinere poteſt, uti amplè explicuit in *Tranſact.* N° 428. Ambram igitur ſtatuit eſſe Bitumen ad Succinum proximè accedens; verum autem Succinum eſſe, cum ſalem acidum volatilem, ſimilem illi ex Succino, non præbeat, haud concedit.

Reiteravit denuò Experimentum, cum Ambræ gryſeæ & vitri pulverizati partibus æqualibus; quia ſuſpicio oriri poterit in Arena hæſiſſe terræ alcalicæ aliquid, quod acidum ex Ambra, ſiquid in ea extiterit, abſorbuerit; ſed operatio exhibuit iterum eadem, niſi quòd phlegma ſaporem ſalis neutri, quippe non acidi præbuerit; & poſt ignem vitri pulverem fundentem, Reſiduum bituminoſum liberum à maſſa vitrea, ei incubuit carbonis inſtar nigri, & ſeſe per totam Retortæ faciem internam ad collum uſque, florum ceu floccorum nigrorum, tenuiſſimorum quidem & ſplendidorum inſtar diſperſerat.

Omnis circa hæc Experimenta Lis facilè componi poteſt, ſi Ambra gryſea quaſi ſubſtantia mixta ex variis peregrinis conflata conſideretur uti cætera mineralia, & non quaſi corpus ſimplex purum uti metalla; nulla enim minera metalli cujuſvis, exempli gratia plumbi, in omnibus portiunculis æqualem metalli vel admixti certi mineralis quantitatem exhibet,

ſimiliter Ambræ gryſeæ portiunculæ variæ eaſdem quantitates ſalis illius acidi non continent; uti videmus in Experimentis *Godfredianis*, ubi in uno phlegma ſaporem ſubacidum, ſalis iſtius ſignum indubitabile, in alio ſaporem habuit ſalis neutri, & portiuncula illa à D. *Neumanno* examinata plus aliis iſtiuſmodi ſalis continuit. Sal prætereà, quò plùs oleo irretitus eſt, eò difficilius ſeparari poteſt. Eodem modo evenit in Experimentis quibuſdam de Calce viva, referente D. *Neumanno* in literis ad D. *Godofredum* datis, ubi ſcribit, illa aliter in Anglia, aliter in Gallia ſucceſſiſſe; unde Gallus quidam eadem reiterans, quæ in Anglia certo modo ſucceſſerant, cum in Gallia eodem modo non reſponderent, omninò falſa eſſe declaravit. Clariſſimus *Neumannus* præterea in aliis literis ad Illuſtriſſimum *R. S. Pr.* D^n *Sloane* ſcriptis declarat ſe nolle, quòd intelligatur ſe dixiſſe (p. 421.) Ambram gryſeam eſſe reverà Succinum, ſed tantummodo eſſe ex genere Succineo, vel Bitumen quidem ad Succinum proximè accedens, quod Ratio fuit veteribus, cum utramque AMBRAM appellaverint, illam *Citrinam*, hanc *odoriferam*. Addit denuo de ſale iſto acido volatili, cujus granum unum vel alterum obtinuit, ſe falli non poſſe, nam in Aqua, uti ſal ſolvebatur, ſyrupum violarum, uti alia acida, colore tingebat rubro; & volatilis eſt, quippe qui diſtillatione aſcenderat.

III. *An*

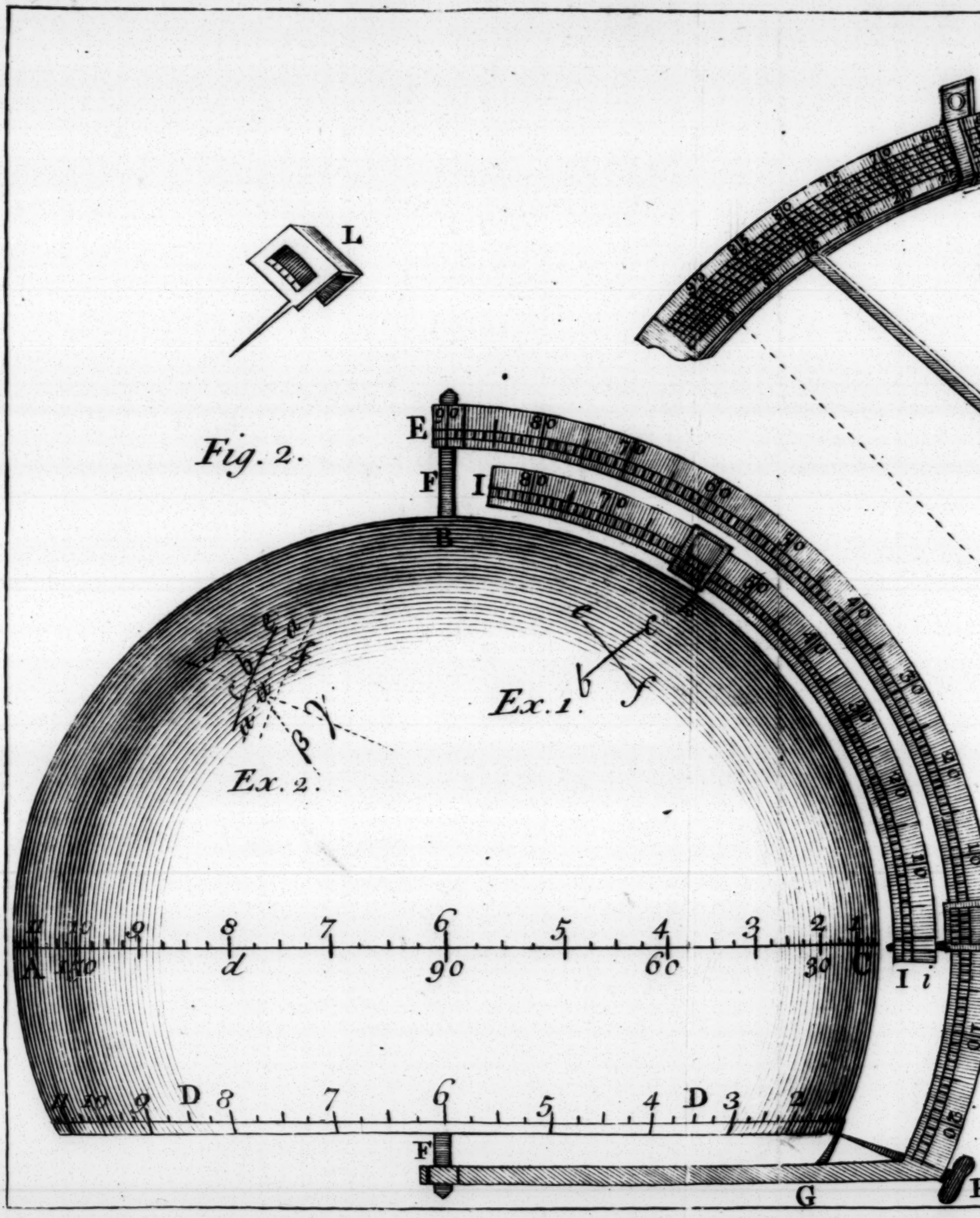
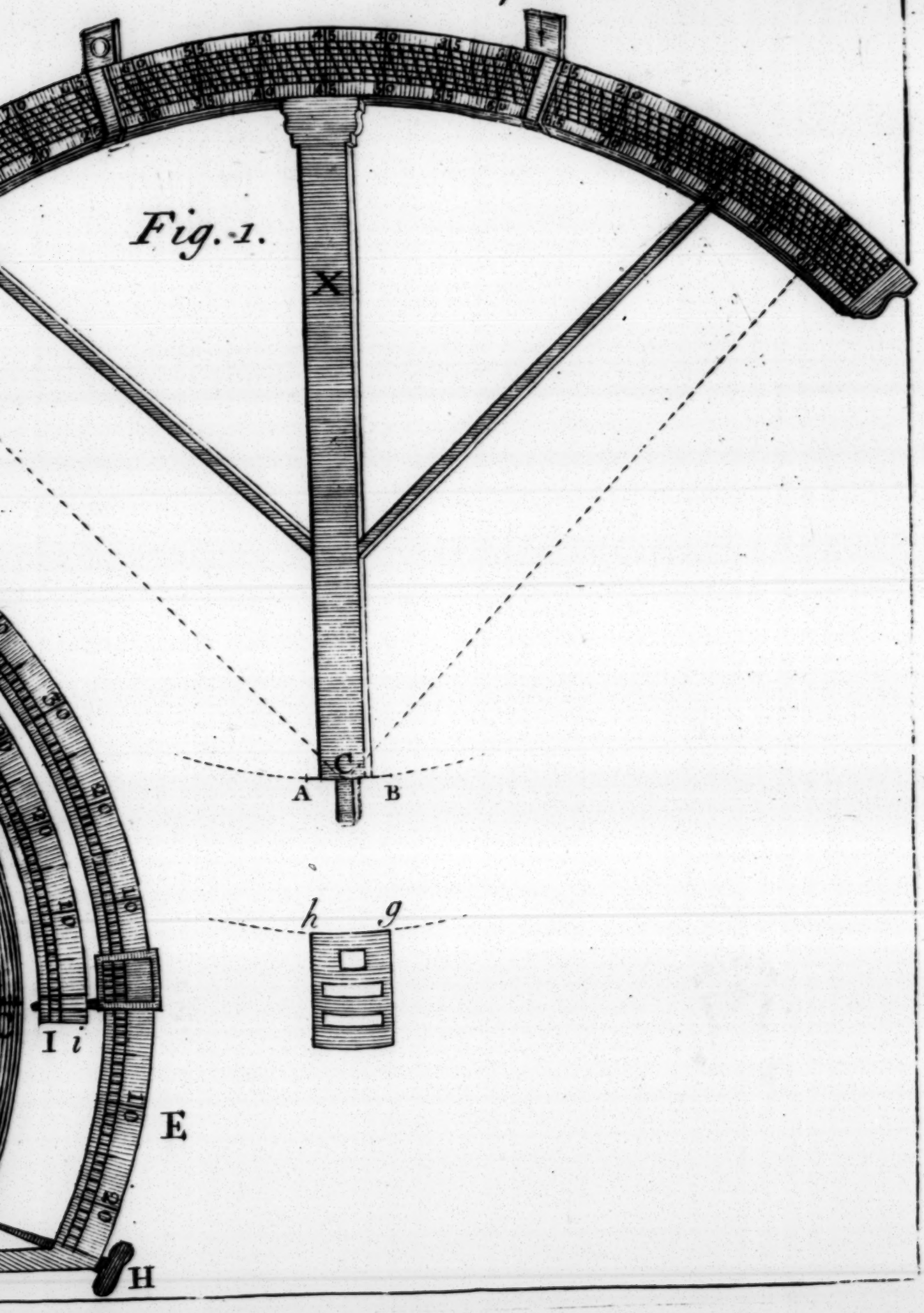


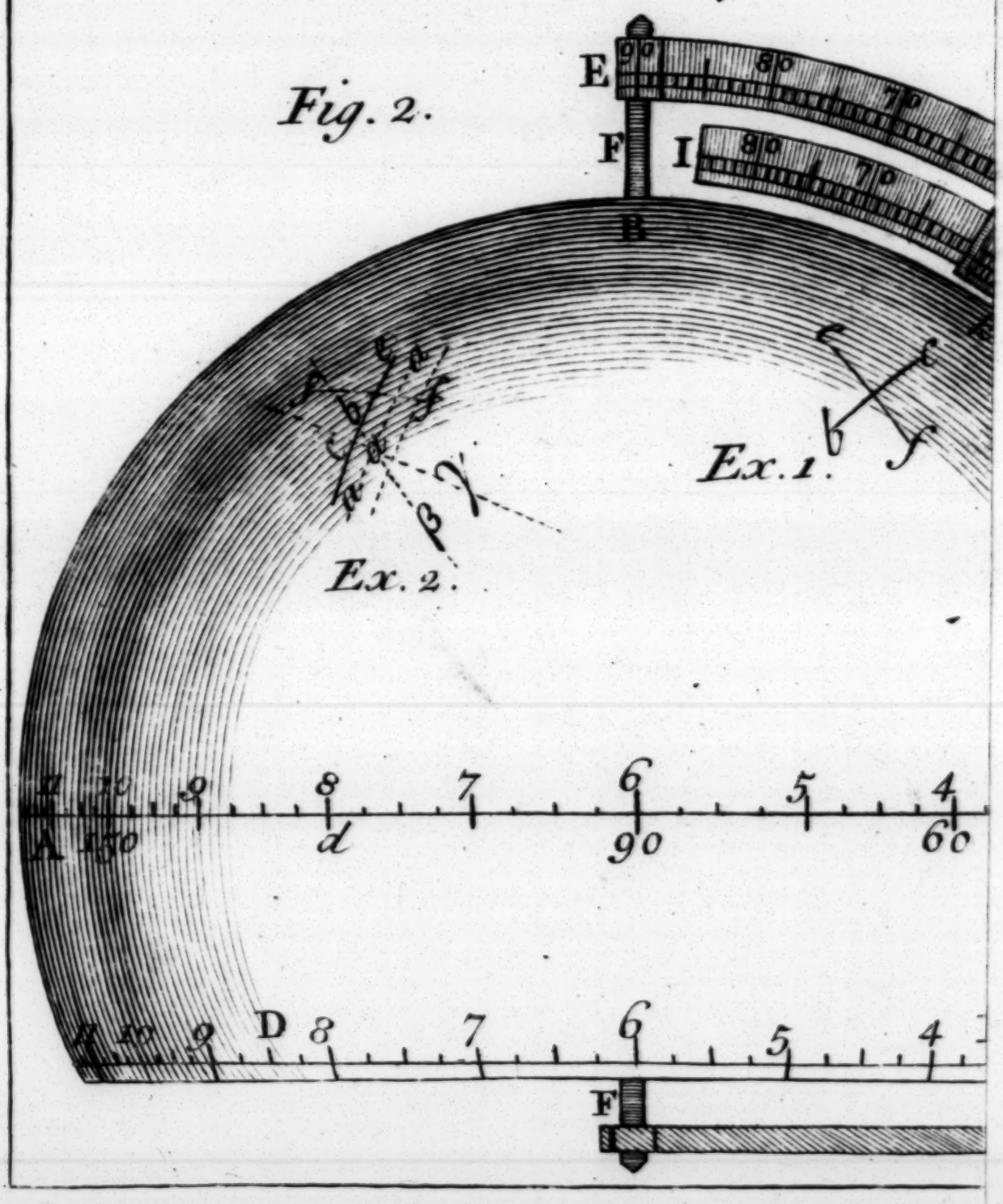
Fig. 2.

Fig. 1.



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Fig. 2.



III. *An Account of* Mr. Thomas Godfrey's *Improvement of* Davis's Quadrant, *transferred to the* Mariner's-Bow, *communicated to the* Royal Society, *by Mr.* J. Logan.

BEing inform'd that this Improvement, propoſed by *Thomas Godfrey* of this Place, for obſerving the Sun's Altitude at Sea, with more Eaſe and Expedition than is practicable by the common Inſtruments in uſe for that purpoſe, was laſt Winter laid before the *Royal Society*, in his own Deſcription of it; and that ſome Gentlemen wiſh'd to ſee the Benefit intended by it more fully and clearly explained: I, who have here the Opportunity of knowing the Author's Thoughts on ſuch Subjects, being perſwaded in my Judgment that if the Inſtrument, as he propoſes it, be brought into Practice, it will in many Caſes be of great ſervice to Navigation, have therefore thought it proper to draw up a more full Account of it, than the Author himſelf has given, with the Advantages attending it; which if approved of by better Judgments, to whom what I offer is entirely ſubmitted, 'tis hoped the Uſe of it will be recommended and further encouraged, as alſo the Author. The Riſe of the Improvement with its Conveniencies, as alſo a Deſcription of it, are as follows.

Tho. Godfrey, having under the greateſt Diſadvantages (as I obſerved in my firſt Letter to Dr. *Halley*, giving an Account of his Invention of the Reflecting Inſtrument) made himſelf Maſter of the Principles of Aſtronomy and Optics, as well as other

Parts of Mathematical Science, applied his Thoughts to conſider the Inſtruments uſed in that moſt momentous Part of Buſineſs, Navigation. He ſaw that on the Knowledge of the Latitude and Longitude of the Place a Ship is in, the Lives of thouſands of uſeful Subjects, as well as valuable Cargoes, continually depend; that for finding the firſt of theſe, certain and eaſy Methods are furniſh'd by Nature, if Obſervations be duly made: But *Davis*'s *Quadrant*, the Inſtrument generally uſed by Britiſh Navigators, (tho' ſeldom by Foreigners) he perceived was attended with this Inconveniency, that the Obſerver muſt bring the Shade or Spot of Light from the Sun, and the Rays from the Horizon, to coincide exactly on the fiducial Edge of the horizontal Vane: That tho' this can be done in moderate Weather and Seas with a clear Sky, and when the Sun is not too high, without any great Difficulty; yet in other Caſes it requires more Accuracy than can in ſome Junctures poſſibly be applied, and more Time than can be allowed for it. In *European* Latitudes, or to thoſe nearer the Northern Tropick, when the Sun is in the Southern Signs, and near the Meridian, he riſes and falls but ſlowly: Yet in Voyages to the *Eaſt* and *Weſt-Indies*, of which very many, eſpecially to the latter, are made, he is at Noon, often and for many Days together, in or near the Zenith, and when approaching to, or leaving it, he riſes and falls, when he has Declination, faſter than even at the Horizon; for it is well known to Perſons acquainted with the Sphere, that when his diurnal Courſe takes the Zenith, he there riſes and falls a whole Degree or 60 Minutes, in the Space of four Minutes

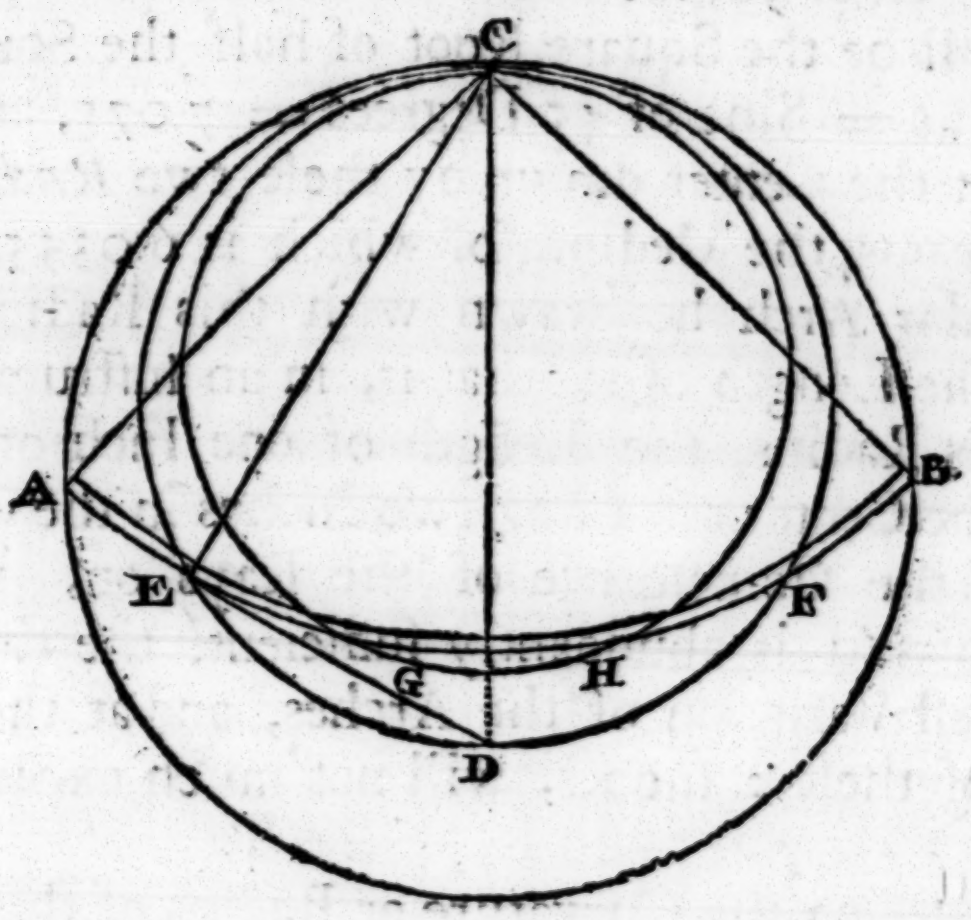
Minutes of Time; ſo that the Obſerver has but one Minute, to come within 15 Minutes of the Truth in his Latitude: While in a middle Altitude, as 45 Deg. he is at Noon above 5 Minutes and a half in Time, in riſing or falling one ſingle Minute of Space, the Odds between which is more than 80 to 1. And yet, perhaps, no Parts of the World require more Exactneſs in taking the Latitude than is neceſſary in Voyages to the *Weſt-Indies*: For it is owing to the Difficulty of it, that Veſſels have ſo frequently miſs'd the Iſland of *Barbados*, and when got to the Leeward of it have been obliged to run down a thouſand Miles further to *Jamaica*, from whence they can ſcarce work up again in the Spice of many Weeks, againſt the conſtant Trade-winds, and therefore generally decline to try for, or attempt it.

But farther, as the Latitude cannot be found by any other Method, that our Mariners are generally acquainted with, than by the Sun or a Star on the Meridian: In a cloudy Sky, when the Sun can but now and then be ſeen, and only between the Openings of the Clouds for very ſhort Intervals, which thoſe who uſe the Sea know frequently happens: As alſo in high tempeſtuous Seas, when tho' the Sun ſhould appear, the Obſerver can ſcarce by any Means hold his Feet; it would certainly be of vaſt Advantage to have an Inſtrument by which an Obſervation could alſo be, as it were, ſnatched or taken in much leſs Time, than is generally required in the Uſe of the common Quadrant.

Tho. Godfrey therefore conſidering this, applied himſelf to find out ſome Contrivance by which the Neceſſity of bringing the Rays from the Sun, and thoſe from the Horizon to coincide (which is the moſt difficult part of the Work) on one particular Point or Line from the Centre, might be removed. In order to which he conſider'd, that by the 21. 3d *Elem. of Eucl.* all Angles at the Periphery of a Circle, ſubtended by the ſame Segment within it are equal, on whatever part of the Circumference the angular Point falls; and therefore, if inſtead of a Quadrant, a Semicircle were graduated into 90 Degrees only, accounting every two Degrees but one; this would effectually anſwer: For then, if an Arch of the ſame Circle were placed at the End of the Diameter of the Inſtrument, every Part of that oppoſite Arch would equally ſerve for taking the Coincidence of the Rays above-mentioned. But ſuch an Inſtrument would manifeſtly be attended with great Inconveniencies; for it would in great Altitudes be much more unmanageable, and the Vanes could not be framed to ſtand, as they always ought, perpendicular to the Rays. He therefore further reſolved to try whether a Curve could not be found to be placed at the Centre of a Quadrant, which would, at leaſt for a Length ſufficient to catch the Coincidence of the Rays, with Eaſe fully anſwer the Intention.

A Curve that in all the Parts of it would in geometrical ſtrictneſs effect this, cannot be in Nature, any more than that one and the ſame Point can be found for a Centre to different Circles, which are not concentric. It is certain that every Arch on the Limb may have a Circle that will paſs through the

the Center, and be a Locus or geometrical Place for the Angle made by that Arch to fall on: but then every Arch has a different one from all others; as in the Figure. Let ABC be the Quadrant, and AB, EF, GH be taken as Arches of it; Circles drawn through each two of these respectively, and through the Center C as a third Point, will manifestly be such Loci or Places: For every Pair of these



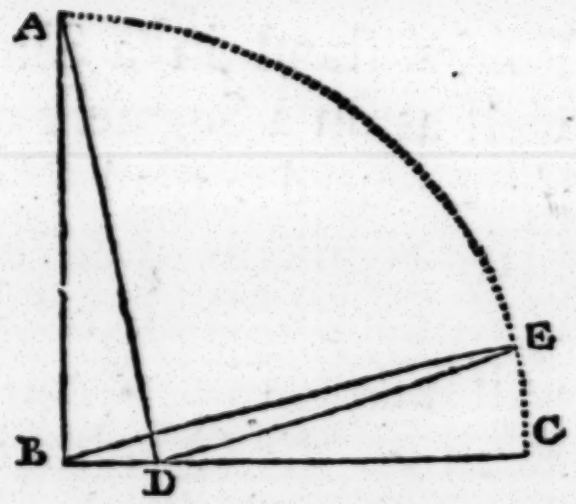
Points stand in a Segment of their own Circle, as well as on a Segment of the Quadrant; and therefore by the cited 21. 3d *Elem.* the Angles standing on these first Segments will every where be equal at the Periphery of their respective Circles, and their Radius will always be equal to half the Secant of half the Arch on the Quadrant. For in the Circle CEDF (for Instance) the Angle CED is right, because 'tis in a Semicircle, CE is the Radius of the Quadrant,

ED

ED the Tangent of the Angle DCE = ½ the Arch EF, and CD is the Secant of the ſame = the Diameter of the Circle CEDF, and therefore its Radius is half that Secant.

Now from the Figure 'tis plain, that in very ſmall Arches the Radius of their circular Place will be half the Radius of the Quadrant, that is, putting this Radius = 10, the other will be 5. And the Radius for the Arch of 90, the higheſt to be uſed on the Quadrant will be the Square Root of half the Square of the Radius = Sine of 45 Degrees = 7.071, and the Arches at the Center drawn by theſe two *Radij* are the Extreams, the Medium of which is 6.0355. And if a circular Arch be drawn with this Radius $\frac{1}{10}$th Part of the Length of it, that is, in an Inſtrument of 20 Inches Radius, the Length of one Inch on each Side of the Center affording two Inches in the whole, to catch the Coincidence of the Rays on, which muſt be own'd is abundantly ſufficient, the Error at the greateſt Variation of the Arches, and at the Extremity of theſe 2 Inches, will not much exceed one Minute.

But in fixing the Curvature or Radius of this Central Arch, ſomething farther than a Medium between the Extreams in the Radius is to be conſidered: For in ſmall Arches the Variation is very ſmall, but in greater it equally encreaſes, as in the Figure where it appears, the Difference between the Angles ABC and ADC is much greater than the Difference between



tween EBC and EDC, though both are ſubtended by the ſame Line BD: for their Differences are the Angles BAD and BED. Therefore this Inequality was likewiſe to be conſidered; and compounding both together, *Tho. Godfrey* pitched on the Ratio of 7 to 11, for the Radius of the Curve to the Radius of the Inſtrument, which is 6.3636 to 10. But on further Adviſement he now concludes on $6\frac{4}{10}$; and a Curve of this Radius of an Inch on each Side of the Center to an Inſtrument of 20 Inches Radius or of $\frac{1}{20}$th of the Radius, whatever it be, will in no Caſe whatever, as he has himſelf carefully computed it, produce an Error of above 57 Seconds; and 'tis very well known that Navigators (as they very ſafely may) in their Voyages intirely ſlight a Difference of one Minute in Latitude.

This Radius is the true one for the circular Place to an Arch of 77° 15′, and the Variation from it is nearly as great at 90 Degrees as at any Arch below it, the greateſt below being at about 44 Degrees, which is owing to the Differences expreſſed by the laſt Figure above, and not to thoſe of the Curvatures or circular Places. Yet this Variation of 57 Seconds ariſes only when the Spot or Coincidence falls at the Extremity of the horizontal Sight or Vane, or a whole Inch (in an Inſtrument of 20 Inches Radius) from the Center, and then only in the Altitudes or Arches of about 44 or 90 Degrees. And in theſe, at the Diſtance of half an Inch from the Center, the Variation is but $\frac{1}{4}$ ſo much, *viz.* about 14″; and at $\frac{1}{4}$ of an Inch, not 4″; at the Center tis preciſely true. Therefore as an Obſervation may be taken with it in one fourth of the Time, that *Davis*'s *Quadrant*, on which

which three Things muſt be brought to meet, in a general way requires: I ſay, conſidering this, and the vaſt Importance of ſuch Diſpatch, in the Caſe of great Altitudes, or of tempeſtuous Seas, or beclouded Skies, tis preſumed the Inſtrument thus made will be judged preferable to all others of the kind yet known. Some Maſters of Veſſels, who ſail from hence to the *Weſt-Indies*, have got of them made as well as they can be done here; and have found ſo great an Advantage in the Facility and in the ready Uſe of them, in thoſe Southerly Latitudes, that they reject all others. And it can ſcarce be doubted, but when the Inſtrument becomes more generally known, it may upon the *Royal Society*'s Approbation, if the Thing appear worthy of it, more univerſally obtain in Practice.

'Tis now four Years ſince *Tho. Godfrey* hit on this Improvement; for his Account of it, laid before the Society laſt Winter, in which he mentions two Years, was wrote in 1732. And in the ſame Year, 1730, after he was ſatisfied in this, he applied himſelf to think of the other, *viz.* the reflecting Inſtrument by Speculums, for a help in the Caſe of Longitude, though 'tis alſo uſeful in taking Altitudes, and one of theſe, as has been abundantly proved by the Maker, and thoſe who had it with them, was taken to Sea, and there uſed in obſerving the Latitude, the Winter of that Year, and brought back again hither before the End of *February*, $173\frac{0}{1}$, and was in my keeping for ſome Months immediately after. It was unhappy indeed, that having it in my Power, ſeeing he had no Acquaintance nor Knowledge of Perſons there, that I tranſmitted not an Account of it ſooner: But I had

had other Affairs of more Importance to me: And it was owing to an Accident which gave me ſome Uneaſineſs, *viz.* his attempting to publiſh ſome Account of it in Print here, that I did it at that Time, *viz.* in *May* 1732, when I tranſmitted it to Dr. *Halley*; to whom I made not the leaſt Doubt but the Invention would appear entirely New. This, on my part, was all the Merit I had to claim, nor did I then, or now aſſume any other, in either of theſe Inſtruments. I only wiſh that the ingenious Inventor himſelf might by ſome means be taken Notice of, in a Manner that might be of real Advantage to him.

There needs not, I ſuppoſe, much more of a Deſcription of the Inſtrument than has been given: I ſhall only ſay, the Bow had beſt be an Arch of about 100 Degrees, well graduated, and numbered both ways; the Radius of 20 or 24 Inches; the Curve at the Center to be $\frac{1}{20}$th of the Radius on each Side, that is, $\frac{1}{10}$th of it in the whole; the Radius of that Curve $\frac{64}{100}$ Parts of the Radius of the Inſtrument; t at the Glaſs for the Solar Vane ſhould not be leſs, but rather larger, than a ſilver Shilling, with its Vertex moſt exactly ſet. And that the utmoſt Care be taken to place the Middle of the Curve at the Centre exactly perpendicular to the Line or Radius of 45 Degrees. As the Obſerver muſt alſo take Care that the two Vanes on the Limb be kept nearly equidiſtant from that Degree; to which I ſhall only add, that it may be beſt to give the horizontal Vane only one Aperture, and not two. The reſt I ſuppoſe may be left to the Workmen. Thus doubting I have already been too prolix on the Subject, to which nothing but a ſincere Inclination to promote

any thing that might contribute to a publick Benefit, and to do ſome juſtice to Merit, could induce me, I ſhall only requeſt that what I have here offered may be conſtrued by that Intention.

Philad. 28th of *June*, 1734.

J. LOGAN.

Note, That the Radius of the Quadrant being divided into 20 equal Parts, the Center × (in *Fig.* 1.) of the Curvature of the Horizon-Vane (A B) muſt be 12 $\frac{8}{10}$ of thoſe Parts from the Center (C) of the Quadrant. The Breadth (A B or *g h*) of that Vane ſhould be $\frac{1}{10}$ of the whole Radius, that is, $\frac{1}{20}$ on each Side of the Center (C).

IV. *The Deſcription and Uſe of an Inſtrument for taking the Latitude of a Place at any time of the Day; by Mr.* Richard Graham, *F. R. S.*

THE neceſſity of finding the Latitude, a Ship is in, is too well known to be inſiſted on: Frequent opportunities of obſerving the Latitude muſt conſequently

conſequently be of very great Advantage to Navigation. The Method uſually practiſed, is by taking the Sun or Stars Meridian Altitude or Zenith Diſtance: In this Caſe, if the Sun does not ſhine but for ſome ſmall Time only, before Noon and after, though it be clear all the reſt of the Day, it is of no uſe for this Purpoſe. Mr. *Fatio, F.R.S.* (in the Year 1728) propoſed a Method for finding the Latitude, from two or more Obſervations of the Sun (or Stars) at any Time, the Diſtance of the ſaid Obſervations in Time, being given by a Watch; but as his Method requires a vaſt Number of Computations, and a great deal of Skill in Spherical Trigonometry, it has very ſeldom been made uſe of, and never but by good Mathematicians. The Inſtrument here deſcribed will anſwer the ſame End, and has theſe Advantages; *viz.*

1*ſt*, It may be very eaſily underſtood by Seamen.
2*dly*, It immediately ſhews the Latitude of the Place.
3*dly*, It gives the Time of Day at Sea when no other Inſtrument can.
4*thly*, It may be made as large, and conſequently as accurate as is deſired.

A Deſcription of the Inſtrument. See *Fig.* 2.

A B C repreſents part of the Hemiſphere of a large Globe (half the Globe, and the Part below the Tropick are cut off, that it may take up the leſs room.) A C, half the Equator, divided into 12 Hours above, and 180 Degrees below, and ſubdivided into Minutes,

as is likewiſe the lower Tropick D D. E E, a moveable graduated Meridian, turning on the Axis F F. G an Index to fix it (by the means of the Screw H) to any Hour. I *i* I, a circular Beam-compaſs, the Center I *i* to be fixed on the Meridian to any Degree and Minute of Declination, by the Method commonly called *Nonius*'s Diviſions: *k* the Point for drawing Arches, which is likewiſe fixed to any Degree and Minute by the ſame Method. As the Meridian is at ſome Diſtance from the Globe, L is a piece of Braſs to fix on the Meridian, marked with *Nonius*'s Diviſions, with a Point reaching down to the Interſection of the Arches, by which means the Diſtance of the ſaid Interſection from the Equator, or its Latitude is found. The Degrees and Minutes may likewiſe be ſhewn by diagonal Lines.

The Uſe of the Inſtrument:

I. PROPOSITION.

From two Obſervations of the Height of the Sun, the Diſtance of the ſaid Obſervations in Time, being given by a Watch, as likewiſe the Declination of the Sun; to find the Latitude of the Place, and Hour of the Day.

I. *When the Ship is at Reſt, that is, at Anchor, or in a Calm, ſo as to have little or no progreſſive Motion.*

Caſe I.

Caſe 1. Suppoſe the Sun in the Equator, on the Day of Obſervation : Fix the Center of the Beam-compaſs at o Degree (or at the Equator,) and move the Point *k* to the Zenith Diſtance (the Complement of the Altitude, taken by the uſual Inſtruments,) and from any Hour, as from C, deſcribe an Arch of a Circle with the ſaid Point, as *b c* (*Ex.* 1.) Suppoſe eight Hours after, by your Watch, you have another Obſervation ; move the Meridian eight Hours farther, to *d*, and fix it there ; and with the Zenith Diſtance then obſerved, deſcribe another Arch as *e f*, the Point where it cuts the former is the Place of Obſervation, and its Diſtance taken on the Meridian from the Equator ſhews its Latitude ; and the Minutes reckoned on the Equator from the Meridian to C and *d* (the Times of Obſervation) ſhew what thoſe Hours were.

Caſe 2. When the Sun has Declination : Fix the Center of the Beam-compaſs on the Meridian, to the proper Degree of Declination for the Day of Obſervation, and proceed as before.

Caſe, 3. If the Obſervations are at a greater Diſtance than twelve Hours, but in the ſame Day : Make uſe of the Complement to twenty-four Hours of the Diſtance in Time, and take the Declination on the contrary, or lower ſide of the Equator ; and inſtead of the Zenith Diſtances, take the Nadir Diſtances or Altitudes increaſed by ninety Degrees.

Thus

Thus you will find the Latitude, and Time of each Obſervation from Midnight. In this Caſe the Beam-compaſs muſt extend to more than 90 Degrees.

Caſe 4. If the Obſervations are more than a Day aſunder; as for Inſtance a Day and two Hours (26 Hours:) Place the Centre of the Beam-compaſs two Hours farther than it was the Day before; but in different Declinations, according to the Table of Declination for the ſeveral Days.

Caſe 5. When the Obſervations are made by a Star: The Center of the Beam-compaſs muſt be ſet to the Declination of the Star; then proceed as before. To find the Hour in this Caſe, the right Aſcenſion muſt be likewiſe given.

Scholium. The ſame Method may be uſeful at Land, when no Meridian Obſervation offers.

II. *The Ship in Motion.*

Caſe 1. Suppoſe the Sun in the Equator: The Diſtance between the two Obſervations eight Hours, as before, and the Arch *a a a* (*Ex.* 2.) deſcrib'd by the Zenith Diſtance of the firſt Obſervation, from the Center C; and the Angle *c a b*, 40 Degrees, is the Angle between the Ship's way, and the Azimuth of the Sun continued, (given by the Azimuth Compaſs;) and that during the eight Hours, the Ship has made one Degree, or 60 Minutes from *a* to *b*, or from the Sun;

then,

then, as Radius is to the Coſine of *c a b* 40 Degrees, ſo is *a b* 60 Minutes to *a c* 46 Minutes; add 46 Minutes to the Zenith Diſtance C *a*; and with *k*, the Point of the Beam-compaſs ſet at that Diſtance, deſcribe the Arch *c b e*; then with the Zenith Diſtance of the laſt Obſervation, whoſe Center is *d*, draw the Arch *f f*; the Point where it cuts the Arch *c b e*, is the Place where the Ship was laſt; and its Diſtance taken on the Meridian from the Equator ſhews its Latitude; the Minutes reckoned on the Equator from the Meridian to *d* (the Time of the laſt Obſervation) ſhew the Hour, or its Diſtance from 12 o' Clock.

Caſe 2. If the Ship had ſailed from *a* to β or towards the Sun: The Coſine of the Angle β *a* γ, or of the Angle between the Ship's Way and the Sun, muſt be ſubſtracted from the Zenith Diſtance of the firſt Obſervation.

N. B. Only the two Arches *c b e*, *f f*, are to be drawn on the Globe, the reſt being added here, to ſhew the Reaſon of the Conſtruction.

Caſe 3. To find the Latitude of the firſt Place: From the Equator, with a pair of Compaſſes, take the Diſtance ſailed 60 Minutes, and with one Foot in the Interſection of the Arches *b e*, *f f*, the Place found before, put the other in the Arch *a a a*, the Zenith Diſtance of the firſt Obſervation, and in this Inſtance, on the left Hand of the Azimuth of the Sun, this is the Place ſought; and its Diſtance taken

ken on the Meridian from the Equator, ſhews the Latitude; and the Minutes reckoned on the Equator from the Meridian to C, the Time of the firſt Obſervation, ſhew the Hour.

The Interval in Time or Degree between the two Places, ſhewn by the Index G, is the Difference of Longitude.

N. B. Thoſe Obſervations are beſt, whoſe Arches croſs each other almoſt at right Angles.

II. PROPOSITION.

The Zenith Diſtances of two Stars, obſerved at the ſame Time, their Declination, and right Aſcenſion being known; to find the Latitude of the Place of Obſervation.

Fix the Center of the Beam-compaſs to the Declination of either of the Stars, and with the Zenith Diſtance of that Star deſcribe an Arch; move the Meridian as many Hours farther as is the Difference of right Aſcenſion of the other Star; and fix the Center of the Beam-compaſs to the Declination of it; and with its Zenith Diſtance croſs the firſt Arch: The Interſection ſhews the Latitude of the Place of Obſervation; and alſo the Diſtance of the right Aſcenſion of the Zenith from that of either of the Stars, by which means the Hour may be known.

If a Celeſtial Globe is made uſe of, then place the Center of the Beam-compaſs over the ſeveral Stars.

The Latitude and Hour being given, the Variation of the Compaſs is eaſily known.

N. B. In order to draw Arches on the Globe; rub ſome black Lead powdered on a piece of Paper; lay the Side which is black'd next the Globe, where you imagine the Interſection of the Arches will be: Then draw them on the clean Side with the Point of the Beam-compaſs, and they will appear on the Globe; and if the Globe is well varniſhed, they may be rubbed out with Bread, or waſhed out with Water.

As Altitudes at Sea are now readily taken, with great Exactneſs, by the Quadrant invented by *John Hadley*, Eſq; V. P. R. S. and as the ſaid Altitudes are the Principles on which the Operations above deſcribed are founded; the previous Uſe of that Quadrant cannot but be of the utmoſt Importance to thoſe who ſhall have Occaſion for this Inſtrument.

The Deſcription and Uſe of this Inſtrument was laid before the *Royal Society Dec.* 9. 1731; but as I knew Mr. *Reid* was contriving one for the ſame Purpoſe, I delay'd making mine Publick. His Method not yet appearing in Print, I have thought proper to communicate my own (eſpecially as 'tis now improv'd) conceiving it may be of ſome Advantage to Navigation.

V. *An Abſtract of the* Meteorological Diaries, *Communicated to the* Royal Society, *with Remarks upon them, by* William Derham, *D. D. Canon of* Windſor, *F. R. S.* [*Vide* PART IV. *in Tranſact.* N° 434.]

PART V. *Containing Meteorological Obſervations made at*

Hall *in* Saxony,		1729.
Sweden	Goſlar	1728.
	Wittemberg	
	Naples	
	Southwick	
	Lunden	
	Swenæker	
	Riſinge	
	Bettna	
	Upſale	
	Hudiskſwald	
	Hernœſand	
	Bygdea	

AN Abſtract of *Meteorological Obſervations* made at *Hall* in *Saxony* in 1729, by *Joh. Joach. Langen*, Math. P. P. O. and in the Year 1728, at *Goſlar* in *Lower Saxony* in *Germany*, by *Joh. Conrad. Trumphius*, M. D. & Pract. *Goſlar*, at *Wittemberg* in *Saxony*, by *Joh. Fred. Weidler*, J. U. D. & Math. Super. Prof. in Acad. *Witteb.*

Witteb. at *Naples*, by *Nic. Cyrillus*, in Urbe *Neap.* Pr. Med. Prof. at *Southwick* in *Northamptonſhire*, by *George Lynn*, Eſq; and in *Sweden*, at *Lunden*, *Bettna*, *Upſale*, and *Bygdea* (mentioned in 1726,) to which the illuſtrious Obſervers have added Obſervations from *Swenæker*, in *Weſtro-Gothia*, Latitude 58° 10′, by *Torſtanius Vaſſenius*, V. D. Miniſt. in *Waſſenda*; at *Wiſingſœ*, by *Magnus Oxelgren*, Lect. Gymnaſii; at *Riſinge* in *Oſtro-Goth*, by *Sueno Laurelius*, Paſt. and Provoſt, at *Stockholm*, Lat. 59°.30′, by *Joh. Backman*, Citizen; at *Hudickſwald Helſingorum*, by *Olave Broman*, Paſtor there; at *Hernœſand* and *Angermann*, by *Jac. Renmarck*, Math. Lectore; at *Lœfanger* and *Umea*, Lat. 63° 43′, by *Bern. Ask*, Theol. Stud. and at *Torneao*, in *Weſtro-Goth.* Lat. 65° 43′, by *Abr. Fougt*, Paſtor there. Extracted for the Uſe of the *Royal Society*, by *William Derham*, D. D. F. R. S.

A TABLE *of the Higheſt, Mean, and Loweſt Barometrical Stations, in the Year* 1728.

	JANUARY.			FEBRUARY.			MARCH.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Hall	29.4½	28.7½	28.1⅓	29. 7	28.10	28. 2	29. 2	28.9½	28. 5
Goſlar							31. 3	30.10	30. 6
Wittemberg	30.2½	29.5¾	28. 9	30.2⅞	29. 9	29. 3	29.9⅞	29. 5	29.1⅓
Naples	29.88	29.50	29.12	29.88	29.71	29.54	29.88	29.63	29.38
Southwick	30.08	29.37	28.67	30.10	29.84	29.58	29.88	29.35	28.83
Lunden	30.20	29.46	28.72	30.22	29.52	28.82	29.81	29.16	28.51
Swenæker	30.36	29.68	29. 0	30.35	29.32	28.29	29.73	29.05	28.37
Riſinge	30.20	29.55	28.90	30.20	29.52	28.85	29.67	29. 0	28.20
Bettna	30.80	30.10	29.40	30.80	30.12	29.45	30.21	29.55	28.90
Upſale	30.46	29.85	29.24	30.50	29.86	29.23	30.00	29.40	28.80
Hudickſwald	30.50	29.75	29.01	30.56	29.89	29.22	30.24	29.52	28.80
Hernœſand	30.60	29.95	29.30	30.50	29.79	29.08	30.25	29.47	28.70
Bygdea.	30.30	29.75	29.20	30.40	29.67	28.94	30.28	25.39	28.50

The Barometrical Table continued.

	April.			May.			June.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Hall	28.11	28. 8	28. 5	29.1 1/3	28. 8	28.3 1/2	29.0 3/4	28. 8	28. 3
Goſlar	31. 4	30.11	30. 6	31. 5	31.0 1/2	30. 8	31. 4	31.0 1/2	30. 9
Wittemberg	30. 0	29.4 1/2	28. 9	30. 1	29. 8	29.2 1/2	30. 0	29.8 1/2	29. 5
Naples	29.88	29.75	29.63	29.80	29.71	29.63	29.88	29.75	29.63
Southwick	29.94	29.48	29.03	29.96	29.51	29.07	29.93	29 70	29.27
Lunden	29.73	29.22	28.51	30.02	29.57	29.12	29.83	29.52	29.21
Swenæker	29.83	29.05	28.27	30.07	29.26	28.45	29.93	29.49	29.06
Riſinge	29.70	29.06	28.43	29.95	29.35	28.75	29 70	29.35	29.00
Bettna	30.22	29.63	29.05	30.50	29.90	29.30	30.20	29.89	29.58
Upſale	30.00	29.49	28.98	30.29	29.73	29.17	30.09	29.73	29.38
Hudickſwald	30.10	29.60	29.10	30.38	29.79	29.20	30.96	30.09	29.22
Hernœſand	30. 7	29.50	29.07	30.20	29.72	29.24	30.10	29.71	29.32
Bygdea	29.80	29.40	29.00	30.10	29.62	29.14	29.96	29.42	28.88

A Thermometrical Table of the Higheſt, Loweſt, and Middle Stations at Naples, Southwick, Lunden *and* Upſale, *in* 1728.

	January.			February.			March.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Naples	49.05	43. 5	38. 5	48. 0	44. 5	35. 0	39. 5	35. 9	32. 3
Southwick	79.	67	55	80	67	54	69	57	45
Lunden	83	68	54	91	73	56	123	98	74
Upſale.	91. 5	80. 9	68. 3	89. 2	77. 9	66. 6	72. 1	63. 0	53. 9

The

The Barometrical Table continued.

	July.			August.			September.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Hall	28.11	28. 8	28. 5	29. 0	28.8½	28. 5	29. 1	28.10	28. 8
Goslar	31. 3	30.11	30. 7	31. 5	31. 0	30.9½	31. 5	31.0½	30. 8
Wittemberg	30. ¾	29. 7	29.3½	30. ½	29. 8	29.4½	30. 0	29.7½	29. 3
Naples	29.80	29.71	29.63	29.88	29.80	29.72	29.88	29.54	29.21
Southwick	29.95	29.57	29.20	30.04	29.51	28.98	30.02	29.53	29.04
Lunden	29.73	29.38	29.02	29.92	29.37	28.82	29.91	29.45	29.00
Swenæker	30.1	29.19	28.28	29.74	29.19	28.64	29.93	29.39	28.86
Rifinge	29.50	29.15	28.80	29.57	28.86	28.15	29.95	29.32	28.70
Bettna	30.12	29.66	29.20	30.10	29.56	29.02	30.38	20.83	29.28
Upfale	29.91	29.55	29.20	29.91	29.45	29.00	30.17	29.71	29.25
Hudickfwald	30.05	29.61	29.18	29.90	29.48	29.07	30.21	29.74	29.27
Hernœfand	29.97	29.5	29.10						
Bygdea	29.85	29.42	29.00	29.96	29.58	29.20	30. 2	29.53	29.05
Torneao				29.85	29.56	29.27	29.92	29.56	29.20

The Thermometrical Table continued.

	April.			May.			June.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Naples	42. 5	33. 2	24. 0	26. 0	18. 5	11. 0	16. 0	9. 7	4. 5
Southwick	71. 0	53.	36	56	40	24	50	35	19
Lunden	148	118	85	172	145	118	176	153	130
Upfale	69. 5	52. 1	44. 7	54. 7	45. 0	35. 3	42. 0	33. 6	25. 2

The Thermometrical Table continued.

	July.			August.			September.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Naples	13. 5	8. 2	3. 0	16. 0	10. 0	4. 0	26. 5	17. 1	7. 7
Southwich	50	34	17	56	39	23	65	48	32
Lunden	172	152	132	153	133	113	150	122	94
Upfale	37. 2	31. 0	25. 5	40. 2	32. 8	25. 5	58. 4	46. 2	34. 6

The

The Barometrical Table continued.

	October.			November.			December.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Goslar	31. 5	31. 0	30. 6	31. 6	30. 5	30. 6	31. 8	31. 1	30. 4
Wittemberg	30. ½	29. 6	29. 2	30. ⅓	29. 0	28. 9	30. 2	29. 6	29. 1
Naples	29.80	29.71	29.52	29.96	29.67	29.38	29.80	29.51	29.21
Southwick	29.98	29.31	28.64	29.95	29.45	28.91	30.04	29.42	28.80
Lunden	30.12	29.51	28.90	29.90	29.26	28.62	29.92	29.32	28.73
Swenæker	30.26	29.55	28.84	29.95	29.14	28.34	30.16	29.53	28.91
Risinge	30.16	29.43	28.70	29.80	29.05	28.30	30.05	29.42	28.80
Bettna	30.80	30.02	29.25	30.40	29.70	29.01	30.70	30.11	29.52
Upsale	30.49	29.83	29.16	30.10	29.44	28.79	30.49	29.87	29.25
Hudickswald	30.97	29.99	29.01	30.22	29.47	29.72	30.60	29.95	29.30
Bygdea	30.40	29.70	29. 0	30.24	29.42	28.60	30.50	29.80	29.10
Torneao	29.90	29.58	29.25						

The Thermometrical Table continued.

	October.			November.			December.		
	High	Mean	Low	High	Mean	Low	High	Mean	Low
Naples	40. 0	31. 3	22. 5	48. 0	42. 0	34. 0	54. 5	54. 5	44. 7
Southwick	71	56	41	84	64	43	87	72	58
Lunden	119	98	78	109	87	64	83	71	59
Upsale	68. 2	58	47. 7	98. 0	57. 0	56. 1	89. 6	76. 8	64. 0

A Table of the Rain *at* Southwick *and* Naples *in the Year* 1728.

	Southwick		Naples			Southwick		Naples	
	Inch	Cent	Inch	Measures		Inch	Cent	Inch	Measures
Jan.	4.	00	4.	15½	Jul.	3.	21	0.	00
Feb.	0.	99	0.	00	Aug.	0.	96	0.	00
Mar.	3.	27	0.	5	Sep.	0.	86	4.	4
Apr.	1.	97	0.	14	Oct.	2.	79	6.	17½
May	1.	44	0.	00	Nov	1.	52	2.	7
Jun.	2.	82	1.	2½	Dec.	2.	43	6.	8½

Rain in the whole Year,

At Southwick, *is* 26 *Inches, and* 26 *Centesimals.*

At Naples, *is* 19 *Inches, and* 14 *Measures.*

Remarks

Remarks on the Meteorological Obſervations of the Year 1728.

As the Obſervations of this Year, which the *Royal Society* hath received from many, and very diſtant Parts of the World, are two large and numerous to be printed in the *Philoſophical Tranſactions*, or read at the Society's Meetings; ſo to make them as uſeful as poſſible, I have put as many of them as I could into Tables, to be ſeen and compared at an eaſy View, as I have done in former Years: But I am forced to omit ſuch of them, where no Account is given of the Inſtruments they uſed, or where none were made uſe of at all, but only verbal Deſcriptions given, that Tables would not admit of. But the Places mentioned in the Tables, had the Society's Glaſſes of Mr. *Haukesbee*'s making.

The *Barometrical* Obſervations I need not ſatiate the Society with Remarks upon, becauſe I have made divers of that Kind, upon the preceding Years: only I ſhall repeat two Things that I formerly took notice of, and have had frequent Confirmations of this Year; *viz.* 1. The great Conformity of the Aſcents, Deſcents, and Stations of the Mercury in the Barometer. 2. That the Range of the Mercury is much greater in the Northerly than Southerly Climes.

As for the *Thermometrical* Obſervations, I have inſerted all that were made with the *Royal Society*'s Glaſſes: but ſuch as were made with other Thermometers, it would have been of little or no uſe to have taken notice of them, unleſs I could have reduced them

to ſome known Meaſure; which only two of the curious Obſervers enabled me to do; but I found that a Matter ſo perplext and difficult, as not to anſwer the great Trouble of it, eſpecially conſidering that theſe Tables exhibit Obſervations made in different and diſtantParts, *viz. Italy*, *Germany*, *England*, and *Sweden*, by which an Eſtimate may be, in ſome meaſure, made of the Temperature of thoſe different Climates of the World. In order to which, I muſt repeat what I mentioned in ſome preceding Year; that in the *Royal Society*'s Glaſſes, the Point of *Extream Heat* is 5 Degrees above 0, that *Temperature* is 45 Degrees below 0, and *Freezing* at 65 Degrees. And if we caſt our Eye upon the ſeveral Months, particularly thoſe of Winter, eſpecially if we conſider that which I have remark'd in 1727, from Dr. *Cyril*, concerning the *Freezing-Point* at *Naples* to be at 55 Degrees, which is at *London* at 65 Degrees, and at *Chriſtiana* and *Bengal* probably as different alſo. I ſay, conſidering theſe Things, it is ſurprizing that the Heat and Cold of thoſe diſtant Places, is not as different as their Northerly and Southerly Situations. But at *Lunden*, I was ſurprized to find the Thermometer much lower in the warmer Months than at *Upſale*, or any other of the *Swediſh* places, 'till I found that in all thoſe Months, they had continual Cold and Rain, when the other places mention little but Fair, or Cloudy, and but little Rain or Cold. And this minds me of a former Obſervation, *That Cold is the Parent of Wet*, eſpecially in Summer.

As to the *Winds* and *Weather*, ſo many are the Places of Obſervation, and ſo many and ſo various the Obſervations, that its next to impoſſible to give

a tolerable Abridgment of them: and therefore my Remarks on the foregoing Years, eſpecially on the ſame Places * and Parts of the World, muſt ſuffice here.

The Quantity of *Rain* and *Snow* were obſerved at *Naples*, *Riſing*, *Bettna*, *Upſale*, *Hudickſwald*, and *Southwick*: but I find no Deſcription of the Inſtruments wherewith they obſerved, nor of their Meaſures, except at *Southwick* and *Naples*, and therefore am forced to omit all but the two latter, in which the Depth is meaſured by *Engliſh* Meaſure, the *Southwick*, by Inches, and hundredth Parts of an Inch; and the *Naples*, by *Engliſh* Inches, and the Obſerver's Meaſures, 23 of which make an *Engliſh* Inch.

Laſtly, That I may omit as little as may be of what the illuſtrious Obſervers take notice of, I ſhall add the Meteors they mention, together with ſome of my own, that happened about the ſame Time.

The firſt was a *Lumen boreale* at *Bettna*, in the Night after *Mar.* 20; and at half an Hour after 8 on *Mar.* 22, at *Windſor*, I ſaw an unuſal ſort of *Streaming*, in which the Columns were not (as uſually) conical, or pointed, nor riſing towards the Zenith-point; but were with parallel Sides, and roſe perpendicularly to the Horizon. They were very bright, emitting a Light equal to that of the Moon in her Quarters. Alſo they roſe from a Bank of Vapours, not curved at Top (as uſually) but lacinated, or broken.

Alſo on *Mar.* 24, the curious *Bettna* Obſerver ſaith, there was, the Night before, *Lumen Efflammans boreale*; which was alſo ſeen at *Læfanger*.

On *Auguſt* 26, at Night was a remarkable *Lumen boreale* at *Bettna*. And the Night before at 10 Hours

* *Vide Tranſact. n.* 433, *p.* 334. *& ſeq.*

20 Minutes *p. m.* a Gentleman going from my Houſe, ſaw towards the Eaſt, about 30 Degrees high, a *Ball of Fire*, about 4 Inches Diameter, blazing, and ſtanding ſtill at firſt, and preſently after, it ran towards the North, and in about five, or more Minutes, he heard an Exploſion like Thunder. Its Blaze emitted a Light equal to that of the Moon at Full.

At the ſame Time, the News-papers ſay, a *Light* in the Sky, like a Comet, was ſeen at *Watford* in *Hertfordſhire*, with Sparks of Fire iſſuing from its Tail; that then it brake out with a prodigious Luſtre, like the Sun, which laſted not long, and was followed with a terrible Clap of Thunder, the Stars twinkling all the while, and not a Cloud to be ſeen. Which Clap, I doubt not, was the ſame which my Friend heard, and which was five or more Minutes in its Paſſage hither.

At *Bettna*, *Lumina borealia* were ſeen on the Nights after *Sep.* 18, 19, and 24; the ſecond of which covered half the Heavens. And on *Sep.* 21, about 10 Hours *p. m.* I obſerved, at *Upminſter*, an unuſual ſort of Tan-coloured thick Vapours towards the N.W.*b*.N. but withal lightſome, and ſuch as the Stars might be ſeen through. And after ſome Time, they ſent forth, in divers Places, *Streaming Lances*, gently and gradually coming and going.

On *Oct.* 13, I ſaw that uncommon ſort of *Streaming* at *Redbridge*, near *Southampton*, the Account of which is printed in *Philoſ. Tranſ.* N°. 410, and the ſame Night at *Bettna* was *Lumen boreale erutans Flammam*, as the Obſerver expreſſes it. At *Læfanger* alſo thoſe Streamings were on the ſame Night, and on the 15th, 18th, 19th, and 23d.

On

On *Oct.* 19th, a *Parhelius* was at *Lunden*, and on the 22d a *Lumen boreale* at *Wittemberge*.

On *Nov.* 12th, at *Windſor*, we had conſiderable *Streaming*; and the ſame was at *Bettna* and *Umea*; and on the 29th at *Læfanger*; and again at *Umea* on *Dec.* 24.

An APPENDIX *to the Remarks on* 1728, *and ſome of the Years preceding it.*

After I had finiſhed the foregoing Obſervations on the Year 1728, I received the curious Oſervations of the illuſtrious *Marquiſs Poleni*, made at *Padua*, * for ſix Years; ſuch of which as are conformable to mine, I ſhall ſubjoin by way of Appendix.

The firſt Thing he gives an Account of is, the *Quantity of Rain and Snow* (in *Engliſh* Meaſure, and according to the Old Stile) that fell before and after this Year 1728, in ſix Years Time, in the following Table.

A Table of the Rain at Padua, *in the Years*

	1725	1726	1727	1728	1729	1730
	Inch Dec.	Inch Dec	Inch Dec.	Inch Dec.	Inch Dec.	Inch Dec.
Janu.	0. 521	1 .355	5 .955	4 .278	1 .085	0 .112
Febr.		1 .460	1 .073	1 .050	1 .245	2 .906
March	0 .889	3 .168	1 .878	4 .832	2 .902	4 .592
April	4 .019	3 .998	0 .498	1 .419	2 .768	1 .638
May	3 .625	1 .368	3 .530	3 .403	2 .634	4 .467
June	0 .036	2 .608	2 .476	2 .103	3 .134	6 .205
July	2 .297	2 .357	2 .930	4 .016	4 .526	2 .339
Auguſt	5 .185	1. 268	5 .067	5 .186	0 .578	4 .269
Sept.	2 .647	2 .900	4 .164	6 .948	3 .267	1 .090
Octob.	7. 104	0 .179	6 .576	5 .163	6 .294	5 .254
Nov.	3 .636	2 .277	5 .091	6 .836	4 .186	0 .534
Dec.	0 .030	2 .390	7 .169	7. 599	2 .804	0 .894
Year	29.989	25.328	46.407	52.833	35.423	34.300

* *Vide Tranſact. n.* 421, *p.* 201. *& ſeq.*

From this Table he obſerves, that the *Februaries* were the drieſt *Months*, and 1726, the drieſt *Year* in all the Six, and that the *Octobers* were the wetteſt *Months*, and 1728 the *wetteſt* of all the ſix Years.

Further alſo he ſaith, that in the four *Seaſons* of the Years (reckoning their beginning from the 10th Day of their reſpective Months, *viz.* of *December*, *March*, *June* and *September*; that I ſay) leſs Wet falls in Winter and Spring, than in Summer and Autumn, and that the wet Weather increaſes, as the Seaſons advance; that in Winter is the leaſt Wet; that it increaſeth in Spring; is more in Summer; and moſt of all in Autumn.

For the Proof of this, he hath made a Table of the mean Quantities of the Rain in the four Seaſons of each of the ſix Years; the Sums of which ſix Years Rain, are in Winter, 39.490 Inches; in Spring, 52.188 Inches; in Summer, 58.25 Inches; and in the Autumn, 74.558 Inches. But in the many Years that I obſerved the Weather at *Upminſter*, I find it not ſo.

After theſe Obſervations of the Weather, the illuſtrious *Marquiſs* proceeds to the *Barometrical Indications* of it; and hath made Tables of the Riſing and Falling of the Quickſilver, together with the Coaſt of the Winds, both againſt Rain, and alſo againſt Snow, hoping to predict from thence the ſeveral ſorts of Weather. But I omit the Tables, becauſe I think little of general uſe can be concluded from them but what is commonly known.

I omit alſo his Table * of the Sum and Mean Altitudes of the Barometer, and Thermometer; but his following Table may be of uſe. A TA-

* *Vide Tranſact. n.* 421, *p.* 210.

A TABLE *of the Higheſt and Loweſt Station of the Barometer, with the Winds and Weather in the*

Year	Month	Day O. S.	Barometer Higheſt	Barometer Loweſt	Winds	Weather at the ſame Time
1725	Janu.	19	30.28		W	Fair.
	Dec.	8		28.56	SW 4	Cloudy.
1726	Nov.	28	30.18		N	Fair.
	Feb.	13		28 92	SW	Cloudy.
1727	Nov.	20	30.24		NW	Fair.
	Octob.	29		28.80	S 2	Cloudy.
1728	Dec.	2	30 20		N	Thin Clouds.
	Dec.	12		29.00	NW	Small Rain.
1729	Dec.	20	30.30		W	Somewhat Cloudy.
	Nov.	10		28.90	N	Rain.
1730	Dec.	20	30.40		N	Fair.
	Feb.	27		28.98	SE	Sunſhine with Cloudy

From this Table at appears, from the Higheſt and Loweſt Stations in the ſix Years, that the greateſt Range of the Barometer, is 1.84 Inches; but at *Naples*, it is only 94 Centeſimals of an Inch; and what it was at other Places, I have given ſome Account of in my Remarks on 1727.

The illuſtrious Obſerver hath alſo been very curious, and ſedulous in his Obſervations of the *Thermometer*; which I am ſorry I can give no acceptable Account of, for want of ſo much Knowledge of his Thermometer, as may enable me to compare his Obſervations with mine.

He hath alſo compared with his own, the Quantities of *Rain*, and the *Barometrical Range* obſerved at *Paris*, by *M. de la Hire*; and finds that the

Paris

Paris Rain is 16.4$\frac{7}{12}$ Lines, and the *Barometrical Range* 2$\frac{5}{12}$ Lines more than the *Padua*.

The laſt Thing which the illuſtrious *Marquiſs* takes notice of is the *Magnetical Declination*, which he ſaith is 13 Degrees *Weſt*, and hath decreaſed in the ſix Years $\frac{10}{60}$ths; that every Day there is a ſmall Alteration in the Declination, ſo that it doth not continue the ſame a whole Day together; that the Declination of all needles (eſpecially if touched by different Magnets) is different a few Sexageſms. But theſe Niceties I recommend to the Enquiry of the Curious, becauſe they diſagree with the Obſervations of *Gilbert*, and moſt of the Magnetical Writers.

FINIS.

ERRATA.

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